

# SCOTTISH CALLOVIAN AND OXFORDIAN OSTRACODA

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## SYNOPSIS

Thirty-eight species of Ostracoda, of which 16 species and subspecies are new, are described from Callovian and Oxfordian strata at three areas of outcrop in Scotland. These species belong to 23 genera of which one *PROCYTHERURA* and one subgenus *LOPHOCYTHERE* (*NEUROCYTHERE*) are new. The stratigraphy of the three areas is briefly described.

## I. INTRODUCTION AND ACKNOWLEDGEMENTS

THE present work is the first of a series of papers concerning the Ostracoda of the Callovian and Oxfordian stages of Great Britain. The ostracod faunas of these two stages have, in Britain, been almost entirely neglected and the only published information, with the exception of one short paper by the author (Whatley 1964) has been contributed by foreign workers. Malz in two papers in 1958, and Lutze in 1960 have described faunas from southern England and Glashoff (1964) has made a regional survey of the Oxfordian fauna of England and Scotland. The substantial number of new taxa described in the present series of papers is evidence of the largely incidental nature of the preceding studies.

Although this first paper is principally concerned with the Callovian and Oxfordian faunas of Scotland, in the case of certain species, material from England has been utilized to facilitate a more complete description.

In the description of the Ostracoda, the following convention is employed :

	mm.
Very small . . . . .	<0.4
Small . . . . .	0.4-0.5
Medium . . . . .	0.5-0.7
Large . . . . .	0.7-0.9
Very large . . . . .	>0.9

This work was undertaken in the Department of Geology, University of Hull, during the tenure of a DSIR/SRC Studentship. The author is considerably indebted to Professor D. T. Donovan (late of that Department), to Dr. J. W. Neale

TABLE I

SYSTEM	STAGE	ZONE	MAJOR STRATIGRAPHICAL UNITS	STAFFIN BAY	BRORA	PORT-AN-RIGH				
	OXFORDIAN	pseudo-cordata	UPPER CALCAREOUS GRIT	shales	not known	not known				
		cautisnig rae	GLOS OOLITE SERIES							
		plicatilis	OSMINGTON OOLITE SERIES BERKSHIRE OOLITE SERIES							
		cordatum	LOWER CALCAREOUS GRIT							
		mariae	OXFORD CLAY							
		lamberti								
	CALLOVIAN	athleta	OXFORD CLAY	Staffin Shales	Shales with thin cementstones	sandstones, limestones and sandy shales Brora sandstone white sandstone	Port-an-Righ sandstones and sandy shales Ironstone ironstones			
		coronatum						Clynelish Quarry Sandstone	white, fine-grained silicified sandstone	shales
		jason						Fascally Sandstone	ferruginous sandstone	
		calloviense						Fascally Shale	sandy shales	not known
		coenig		Shales with thin limestone at base	Brora Brick Clays	grey and blue clays				
		macrocephalus		black micaceous shale	Brora Shales	green and khaki shales	shales			
		calloviense		KELLAWAYS ROCK	not known	? absent	? absent			
		coenig		KELLAWAYS CLAY				Brora Roof Bed hard calcareous sandstone		
		macrocephalus		UPPER CORNBRAsh	Red nodular limestone	Possibly developed as part of Great Estuarine Series		not known		

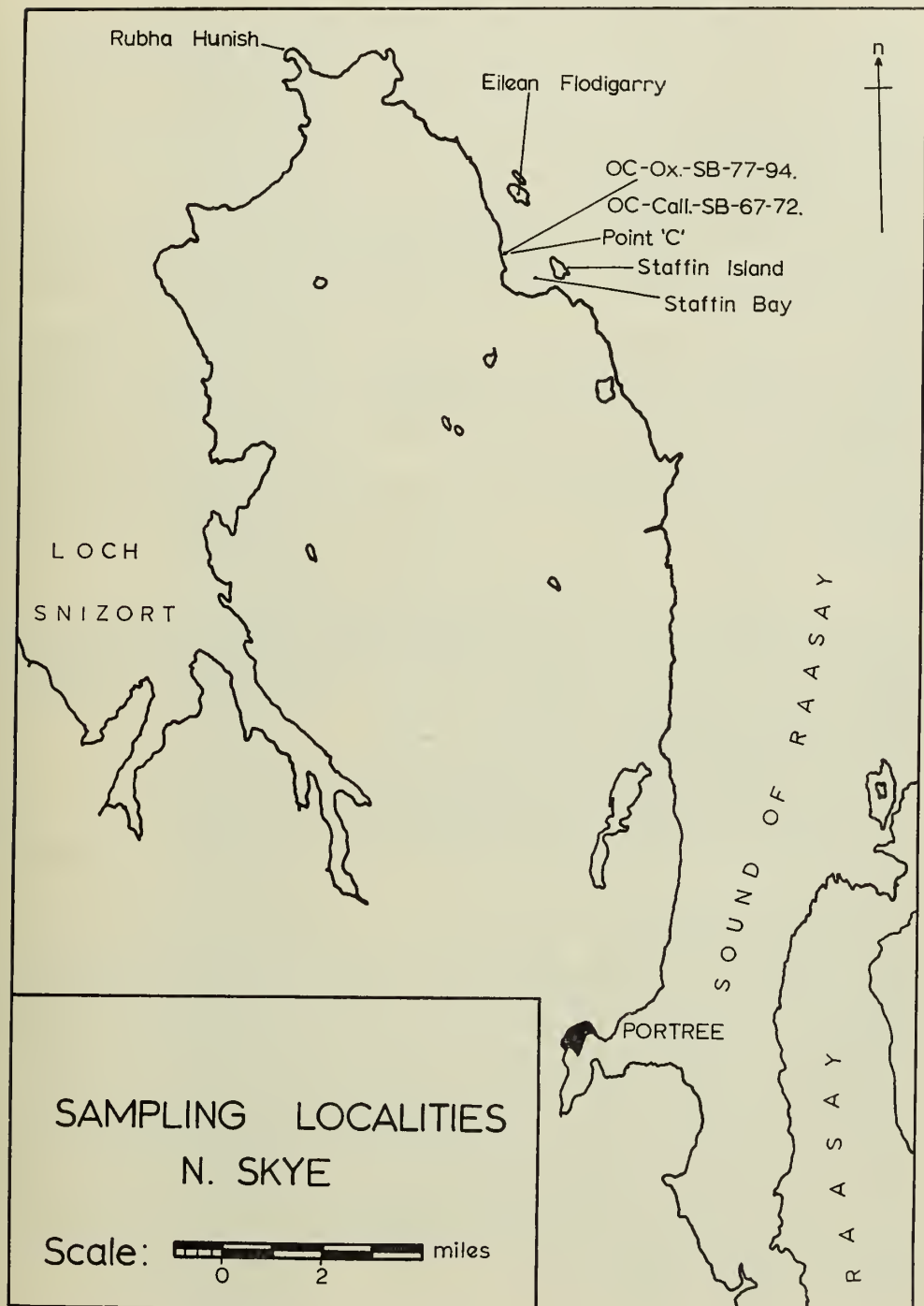


FIG. 1

and Mr. L. F. Penny for their encouragement and assistance during the completion of this work. My thanks are also due to members of the technical staff at Hull, in particular to Mr. N. Bell, for valuable assistance. Additionally, permission to deposit type specimens in the British Museum (Natural History), granted by the University of Hull on the recommendation of Professor M. R. House and Dr. J. W. Neale is gratefully acknowledged.

The author has received very considerable assistance from colleagues in this country and abroad and gratefully acknowledges receipt of copies of their work and of specimens for comparison. In particular my thanks are due to Dr. R. H. Bate of the British Museum (Natural History) for a great deal of assistance and encouragement.

Lastly my grateful thanks are due to Professor Alan Wood for his support in preparing this paper ; to my friend and colleague, Dr. J. R. Haynes, for critically reading the manuscript and to Mr. H. Williams for technical assistance. Mr. P. Sherrington kindly drew Fig. 6, and Miss P. Matthews and Miss G. Jones typed the manuscript.

The ostracods described in this paper have been deposited in the collections of the University of Hull (prefix HU.) and in the British Museum (Natural History) (prefix Io.)

## II. LOCATION AND STRATIGRAPHY

Deposits of Jurassic age occur on a number of Inner Hebridean Islands and the adjacent mainland and also along the north-east coast of Scotland in Ross and Sutherland. Callovian and Oxfordian strata occur in both of these areas although their outcrops are somewhat restricted.

Samples have been collected from three localities :

1. From the Callovian and Oxfordian of Staffin Bay, Trotternish, Skye.
2. From the Callovian of Brora, Sutherland.
3. From the Oxfordian of the Ross Peninsular at Port-an-Righ.

A summary of the Callovian and Oxfordian Strata in these areas is given in Table 1.

### 1. *Staffin Bay.* (Fig. 1.)

The succession at Staffin Bay consists largely of a thick sequence of blue and grey marine shales with a few thin cementstones. These beds were first described by Macculloch (1819, p. 345) and were later shown by Forbes (1851) to be equivalent to the Oxford Clay of England. Macgregor (1934, p. 397) has described the section in detail and it is from his locality at point 'C' (NG473694) that the present samples were collected. Using the evidence of the abundant ammonite fauna in the succession, Macgregor identified strata of Lower and partly Upper Oxfordian age. Anderson, (1961, p. 23) mentions an early record of ammonites indicating the presence of zones from the *jason* to the *cordatum* followed by Upper Oxfordian strata of the same facies. Cordey (1962) working on foraminifera from the section at point 'C' demonstrated the presence of the *lamberti*, *mariae* and *cordatum* zones, this evidence being augmented by the identification of ammonites collected by Cordey from this section by Dr. J. H. Callomon.

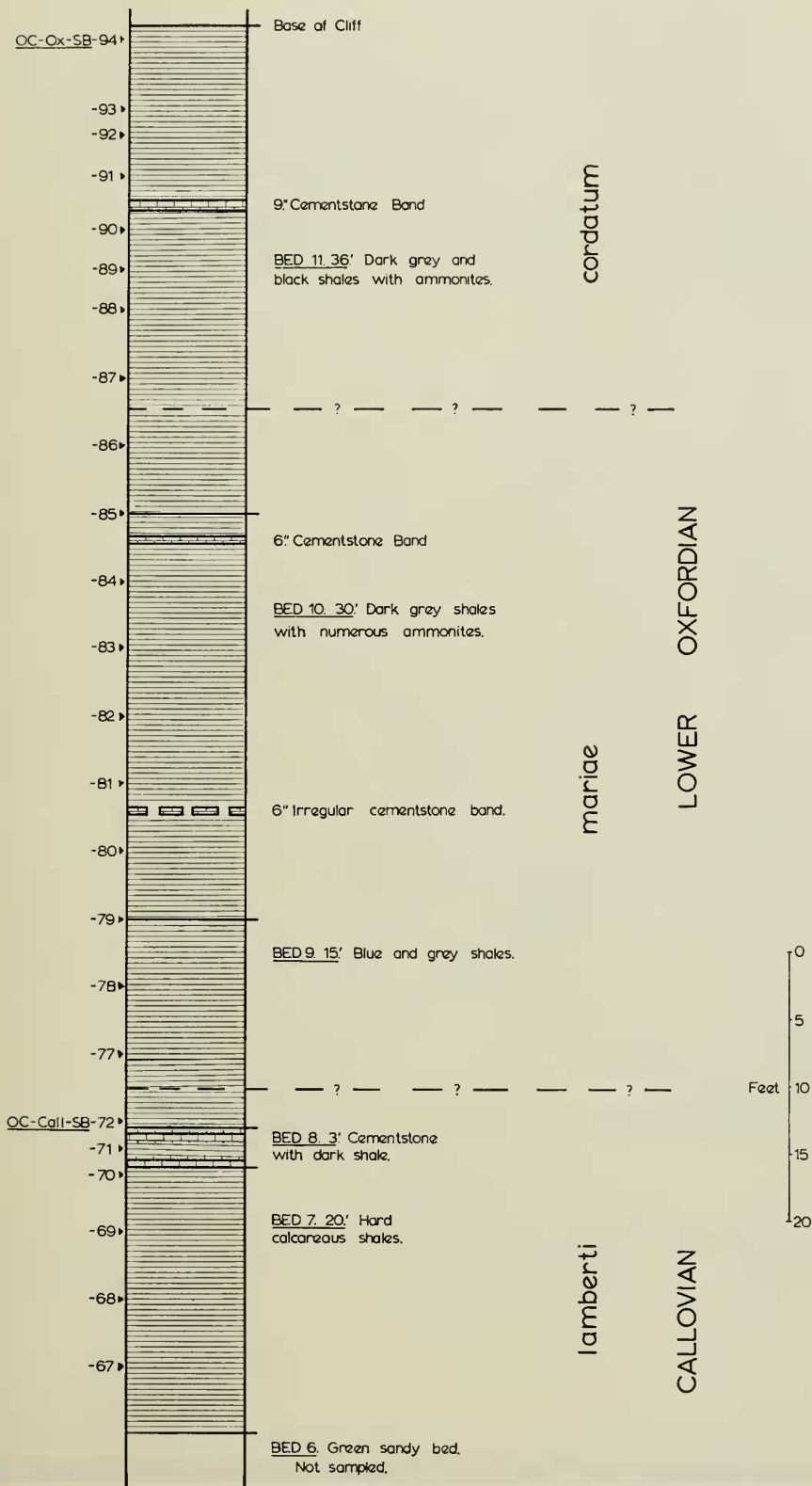


Fig. 2. The stratigraphical succession and the position of the samples at Staffin Bay.

The most recent works on the Staffin Bay succession are by Turner and Anderson, both in 1966. Both workers give detailed accounts of the succession which, however, differ somewhat in thickness of various units and in the position of the zonal boundaries. Both workers do, however, recognize strata with ammonites below the *lamberti* zone. The evidence from the Ostracoda is such that the *lamberti*, *mariae* and *cordatum* zones can be recognized and compared to similar strata elsewhere in Britain. The section measured and collected by the author is given in Fig. 2.

Unfortunately, the two lowest samples were barren of either ostracoda or foraminifera and the age of these lowest shales, which may belong to the *athleta* zone cannot be resolved.

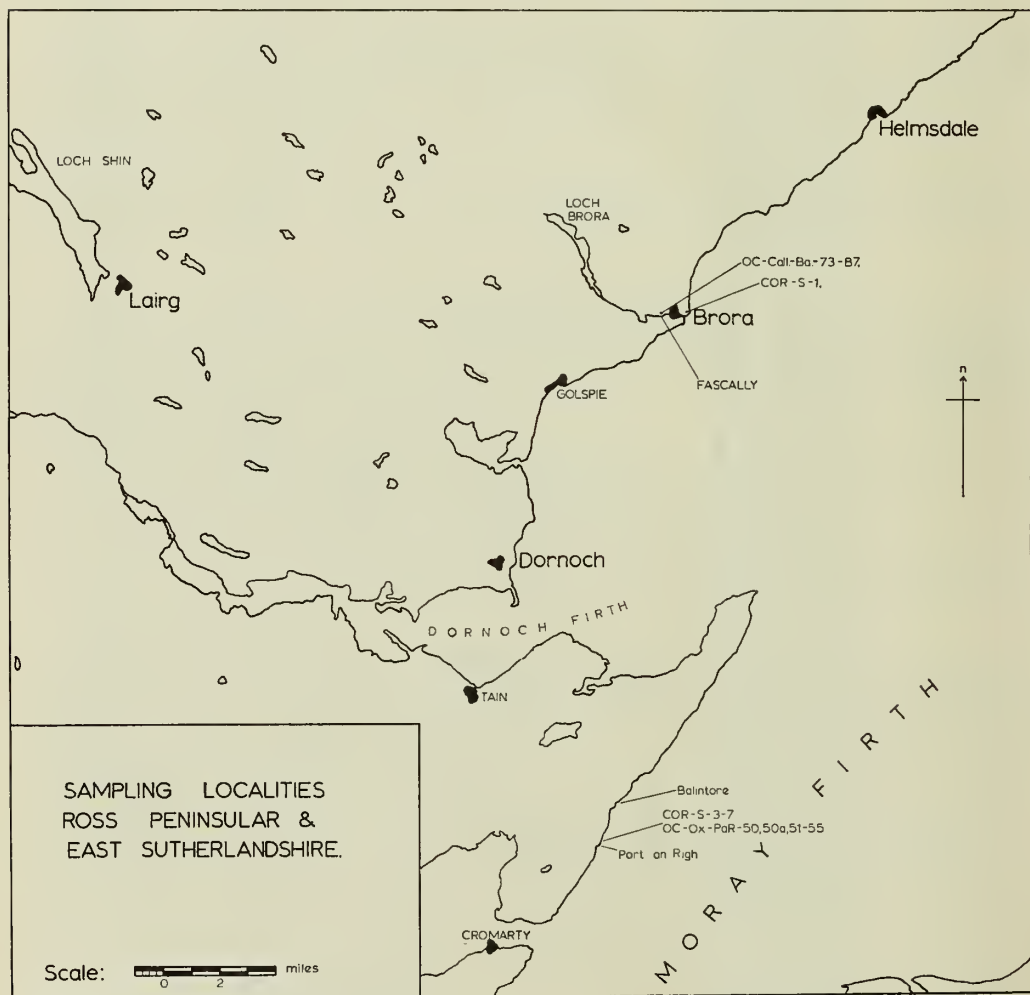


FIG. 3



SAMPLES

OC-Call-Ex

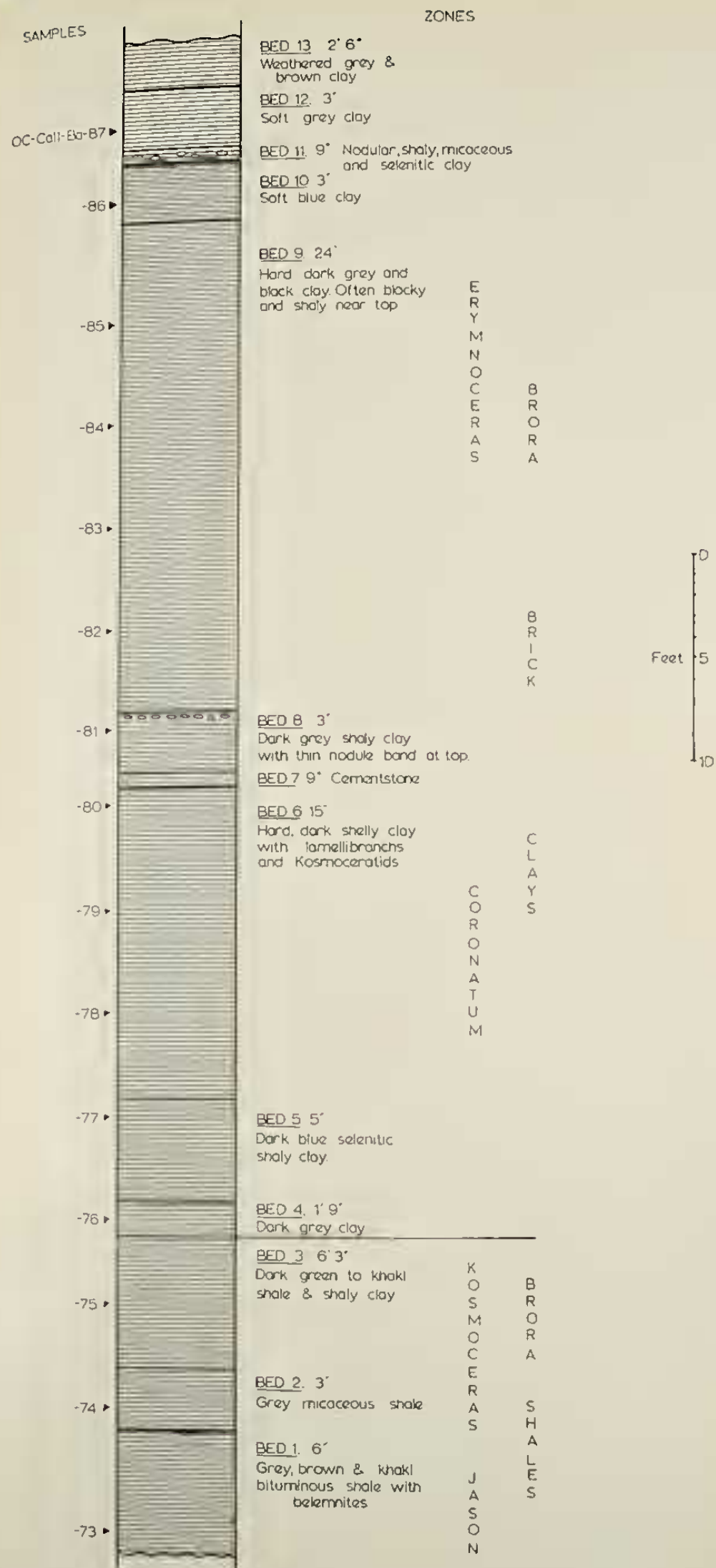


FIG. 4. The stratigraphical succession and position of samples at Fascally brick pit, Brora.

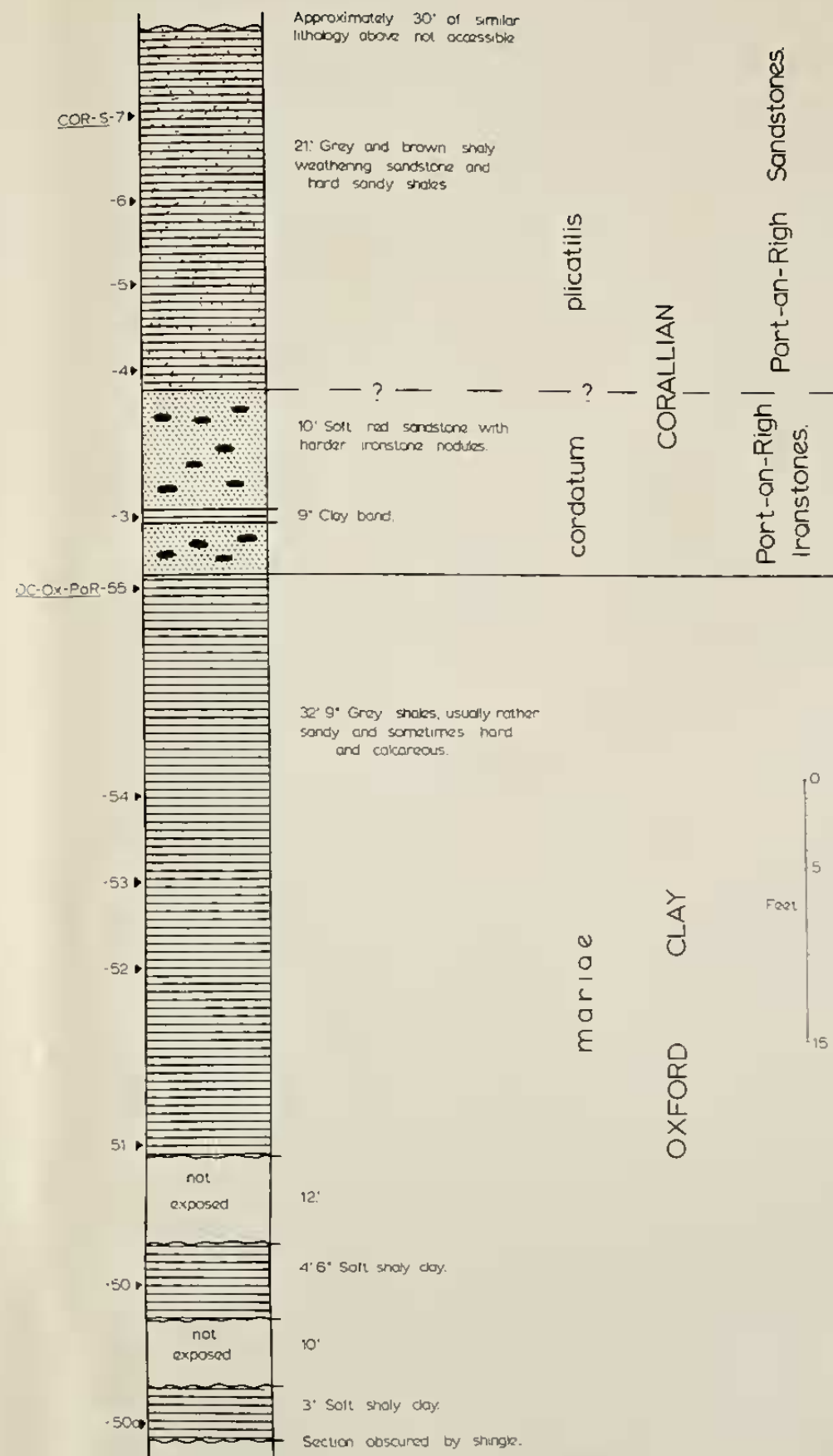


FIG. 5. The stratigraphical succession and position of samples at Port-an-Righ.

The overlying Upper Oxfordian shales were badly exposed in 1963 and only a few poorly located samples were collected. Unfortunately, both these and those kindly sent to the author by Judith Turner, proved to be barren of ostracods.

2. *Brora*. (Fig. 3.)

Callovian and Oxfordian strata occur amongst the narrow strip of Jurassic deposits along the east coast of Sutherlandshire, between Golspie and Helmsdale. They are best displayed around Brora and are often of different facies to their equivalents in England and elsewhere in Scotland. The *macrocephalus* zone is not recognized but may be present as a non-marine facies of the Great Estuarine Series. The first deposit with undisputed Callovian fossils is the Brora Roof Bed which contains ammonites

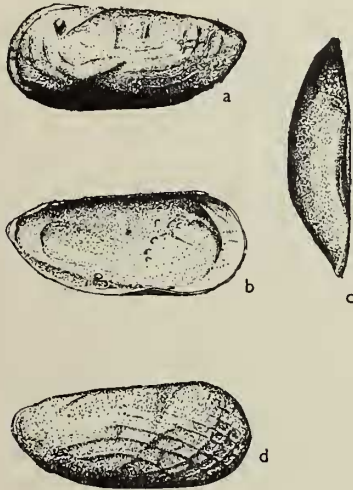


FIG. 6. *Procytherura tenuicostata* Gen. et. sp. n. A-C, Left valve, holotype (HU.18.J.30). a. External view ; b. internal view ; c. dorsal view. d. Right valve, paratype (HU.18.J.31). External view.

indicative of the *koenigi* zone. The succeeding Brora Shales and Brora Brick Clays are probably of *jason* and *coronatum* zone age respectively although the ammonites have not yet been worked out in detail. Although Ostracoda are abundant in the Brora Brick Clays, in the succeeding Callovian and Oxfordian deposits, which are to a large extent arenaceous in character, some twenty samples failed to reveal a single specimen and are not recorded here. A summary of the Callovian and Oxfordian succession at Brora is given in Table 1. and the details of the succession in the *jason* and *coronatum* zones, at the Fascally coal mine brick pit (NC 898042), together with the position of the samples, is given in Fig. 4.

3. *Port-an-Righ*. (Fig. 3.)

Middle and Upper Jurassic strata are exposed on the Ross Peninsular some 30 miles south of Brora. Here, at Port-an-Righ (NH 854734), a series of small intertidal

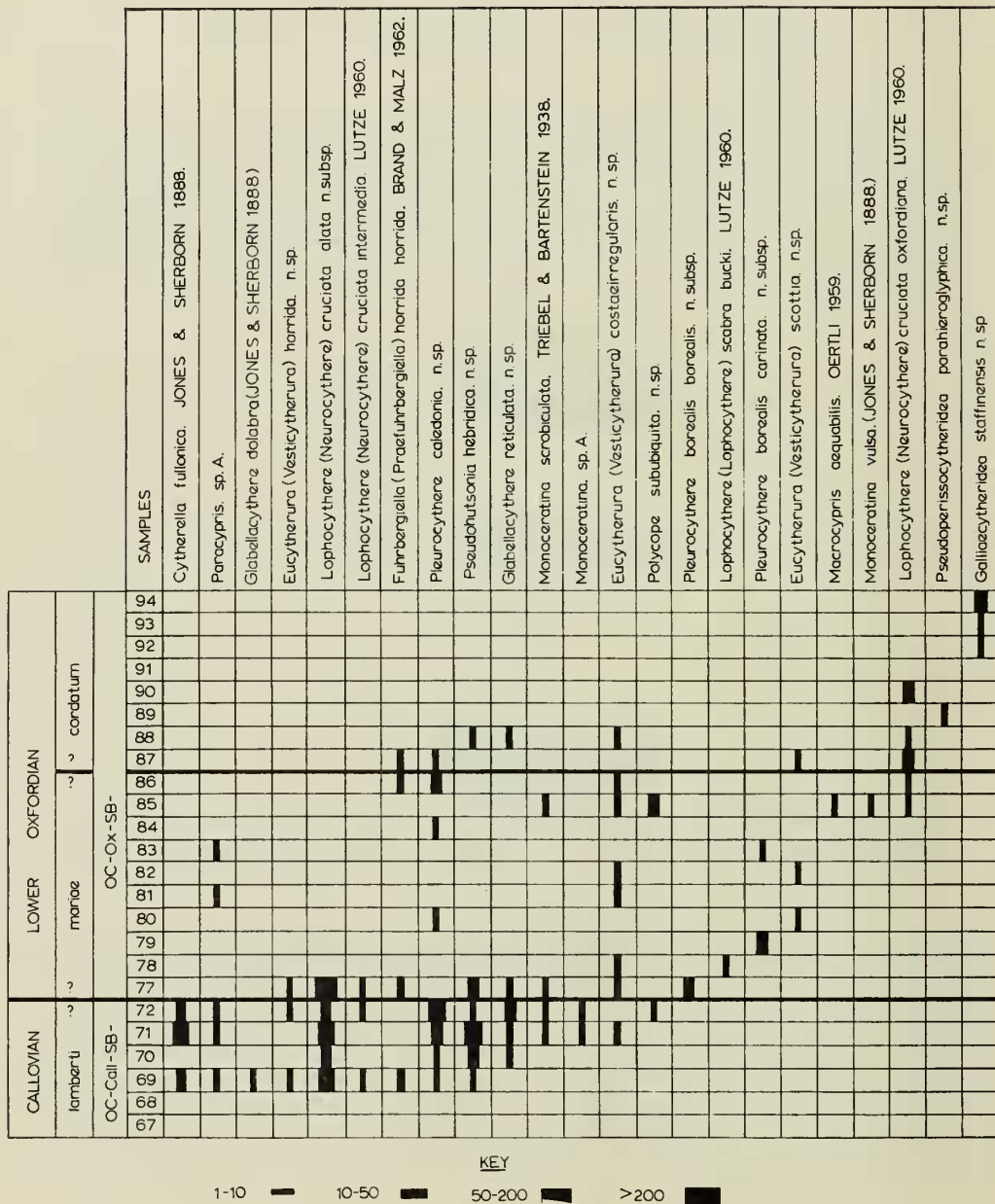


FIG. 7. Distribution of the ostracoda in the Staffin Bay Succession.

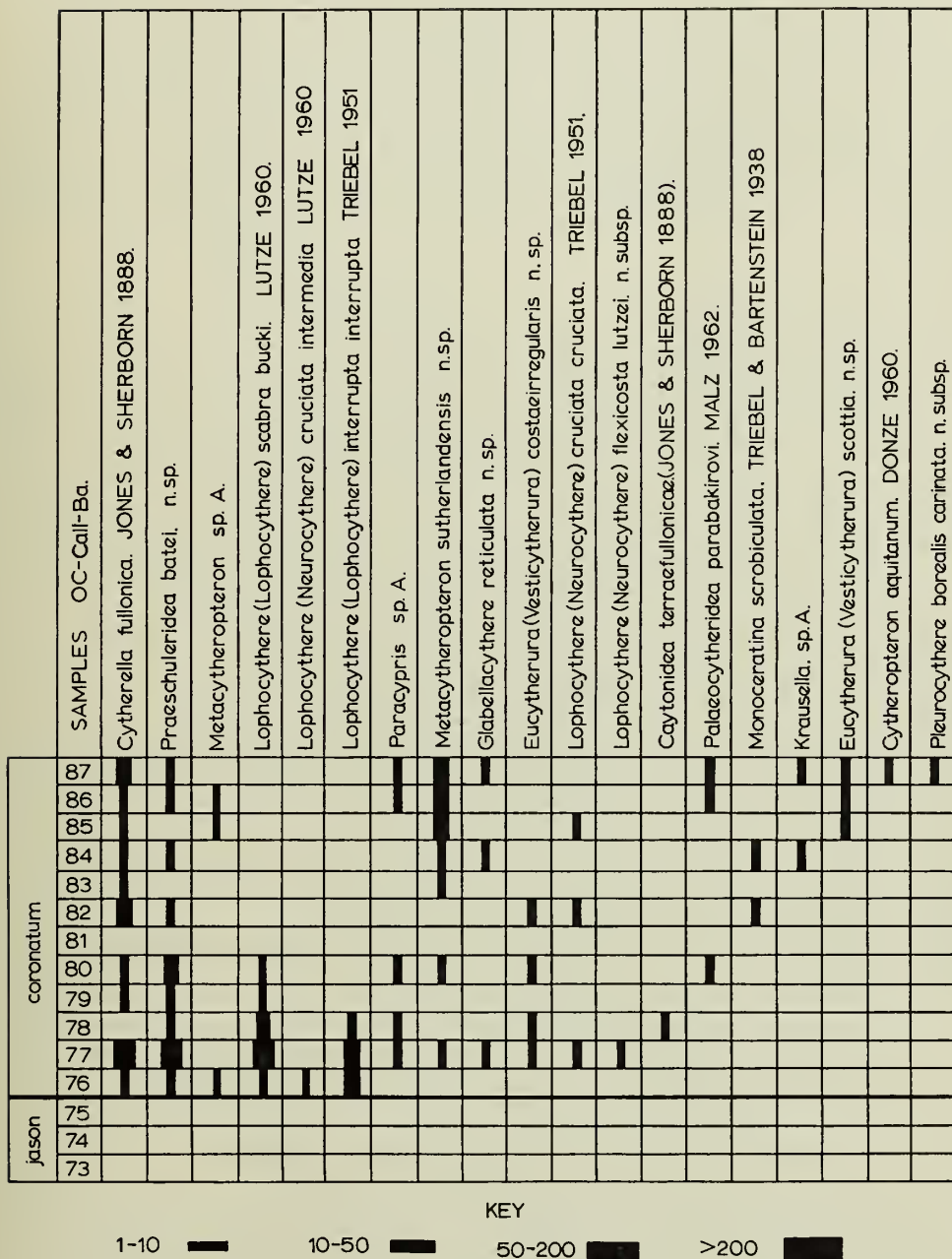


FIG. 8. The distribution of the ostracoda at Fascally Brick Pit, Brora.

outcrops have been preserved by downfaulting against Old Red Sandstone and Moines along a large fault line which may be connected to the Great Glen Fault.

The succession begins with the Brora Roof Bed, and, as at Brora, the succeeding *calloviense* zone seems to be absent. When collected by the author in 1963, the lowest clays and shales of the Callovian were obscured and the lowest beds seen were shales of the *mariae* zone. These are succeeded by the Port-an-Righ Ironstone and Sandstone of *cordatum* and *plicatilis* zone age respectively. The general succession in this area is shown in Table 1 and the section measured and collected by the author in Fig. 5.

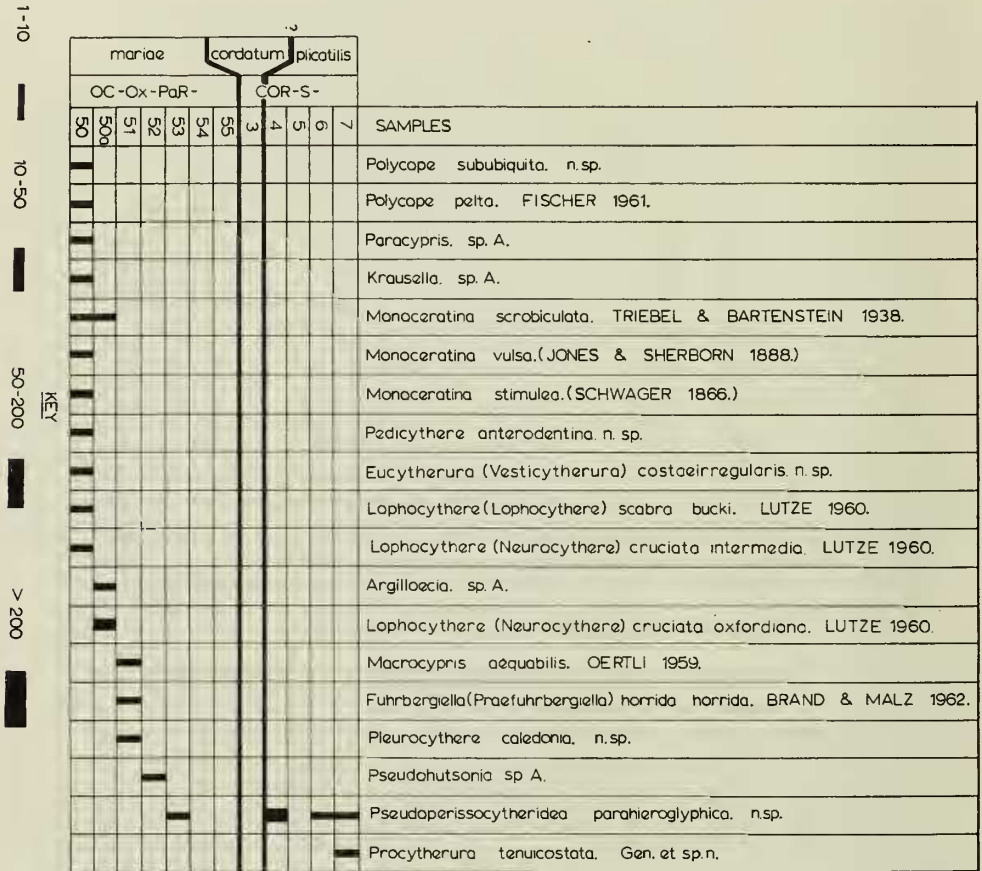


FIG. 9. The distribution of the ostracoda at Port-an-Righ.

The vertical distribution of the Ostracoda at Staffin Bay, Brora and Port-an-Righ is given in Figs. 7, 8 and 9 respectively.

It is not intended to discuss the stratigraphical and palaeoecological potential of these faunas at this stage. However, when the author's taxonomic work on the

Callovian and Oxfordian Ostracoda of England has been published, it is intended that this will be followed by a detailed appraisal of the Stratigraphic, phylogenetic and palaeoecological implications of the Ostracoda from British strata of these two stages as a whole.

The samples used in this study are notated in the following manner :

- |      |   |             |
|------|---|-------------|
| OC   | = | Oxford Clay |
| Call | = | Callovian   |
| COR  | = | Corallian   |
| Ox   | = | Oxfordian   |
1. Staffin Bay
    - OC-Call-SB-67 to 72
    - OC-Ox-SB-77 to 94
    - Stratigraphical position as shown in Fig. 2.
  2. Brora
    - OC-Call-Ba-73 to 87
    - Stratigraphical position as shown in Fig. 4.
  3. Port-an-Righ
    - OC-Ox-PaR 50 to 55
    - COR-S-3 to 7
    - Stratigraphical position as shown in Fig. 5.

### III. SYSTEMATIC DESCRIPTIONS

Subclass *OSTRACODA* Latreille 1806

Order MYDOCOPIDA Sars 1866

Suborder CLADOCOPINA Sars 1866

Family **POLYCOPIDAE** Sars 1866

Genus **POLYCOPE** Sars 1866

***Polycope pelta*** Fischer 1961

Plate I. Figs. 1-4.

1938 Ostracode 227 Wicher : pl. 27, fig. 4.

1956 *Polycope* sp. 227 (Wicher 1938) Apostolescu and Bourdon: table 2.

1961 *Polycope pelta* n. sp. Fischer, 1961 b: 499, pl. 2 mitte.

1962 *Polycope* sp. B. Donze : 127, pl. 1, fig. 2.

1963 *Polycope pelta* Fischer 1961. Plumhoff : 17 and 18, pl. 1, figs. 1, 2.

**MATERIAL.** One complete carapace, (Io.5030), from the *mariae* zone of Port-an-Righ.

**DIMENSIONS.** The dimensions of a second specimen from the *athleta* zone of Oxfordshire are as follows. Length 0.41; height 0.41; width 0.23.

**REMARKS.** This species has not previously been recorded from above the Aalenian and this is the first record from Britain.

*Polycope sububiquita* n. sp.

Plate 1. Figs. 5-11, 15.

- 1958 *Polycope* sp. 11. Bizon: 21.  
 1959 *Polycope* sp. 11. Oertli: 15, pl. 1, fig. 1.  
 1962 *Polycope* sp. A. Donze: 127, pl. 1, fig. 1.  
 1964 *Polycope* sp. 11. Glashoff: 53, 54, pl. 5, fig. 22.  
 1964 *Polycope* sp. 12. Glashoff: 54, pl. 5, fig. 21.

DIAGNOSIS. *Polycope* with outline varying from subovate to subcircular, and angle of anterior margin above mid-height. Dorsal margin of variable length, straight or slightly convex. Smooth or with weak reticulations.

HOLOTYPE. One carapace, HU.16.J.5. From the *mariae* zone of Woodham brickpit Oxfordshire. Sample OC-Ox-Wm-5.

MATERIAL. 256 specimens, mostly carapaces.

DISTRIBUTION. Ranging from the *athleta* to the *mariae* zone in England, and occurring in the *mariae* zone at Port-an-Righ, and in the *lamberti* and *mariae* zones of Staffin Bay.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Carapace	HU.16.J.5	0.43	0.35	0.23
PARATYPES from sample OC-Call-Wm-24.				<i>-athleta</i> zone Woodham.
Carapace	Io.5031	0.37	0.35	0.23
Carapace	Io.5032	0.41	0.35	0.23
Carapace	Io.5033	0.39	0.33	0.23
Carapace	Io.5034	0.40	0.33	0.24

DESCRIPTION. Small to very small. Subovate to sublenticular. Valves subequal. Anterior margin with angle at or above mid-height. Posterior margin with well-rounded and obtuse cardinal angle. Ventral margin convex; dorsal margin variable, usually short, straight or slightly convex. Maximum dimensions: height; just posterior to the anterior cardinal angle, length; at mid-height, width; dorso-medially.

Ornament smooth or reticulate. Marginal areas very narrow; inner margin and line of concrescence apparently diverging throughout.

ONTOGENY. The penultimate and preceding growth stages occur and have the following dimensions. (*athleta* zone, Woodham):

	Length	Height
Penultimate instar (carapace)	0.32	0.27
Ante-penultimate instar (carapace)	0.25	0.24

REMARKS. The instars are more symmetrically lenticular than the adults. This is an extremely variable species as regards both shape (subovate to sublenticular) and ornament (smooth to reticulate). The range on the continent would seem to be from the Callovian to the Kimmeridgian. Glashoff differentiates two species, 11 and 12 the former being more circular than the latter. In the present material, there is a



complete range of variation between the two types which are consequently considered to be conspecific.

Order PODCOPIDA Müller 1894

Suborder PLATYCOPINA Sars 1866

Family CYTHERELLIDAE Sars 1866

Genus *CYTHERELLA* Jones 1849

*Cytherella fullonica* Jones & Sherborn 1888

Plate 1. Figs. 12-14, 16, 18.

- 1888 *Cytherella fullonica* n. sp. Jones & Sherborn : 274, pl. 1, figs. 12a-c.  
 1963 *Cytherella fullonica* Jones & Sherborn 1888. Bate : 184, pl. 1, figs. 1, 2.  
 1963 *Cytherella* sp. Oertli, pls. XXXIII ; XXXIV ; XXXV.  
 1969 *Cytherella fullonica* Jones & Sherborn. Bate : 395, pl. 5, fig. 9; pl. 6, fig. 1.

MATERIAL. 238 valves and carapaces.

DISTRIBUTION. Occurring in the *coronatum* zone at Brora ; the *lamberti* zone at Staffin Bay, and in the *athleta* zone at Woodham brickpit Oxfordshire.

DIMENSIONS. OC-Call-Ba-77 ; *coronatum* zone Brora.

		Length	Height	Width
R.V.	HU.16.J.11	0.79	0.44	0.19
L.V.	Io.5036	0.72	0.38	0.16
Carapace	Io.5037	0.77	0.44	0.33

ONTOGENY. The adult and the four preceding growth stages are recognized. Dimensions from sample OC-Call-Ba-77, *coronatum* zone Brora, are given below.

		Length	Mean	Height	Mean	L : H
Adult	6 R.V.	0.77-0.79	0.78	0.43-0.46	0.44	1.77 : 1
	6 L.V.	0.71-0.76	0.73	0.37-0.41	0.38	1.88 : 1
Penultimate	6 R.V.	0.60-0.64	0.62	0.35-0.37	0.36	1.70 : 1
	6 L.V.	0.61-0.67	0.64	0.33-0.36	0.35	1.85 : 1
Antepenultimate	3 R.V.	0.54-0.56	0.55	0.31	0.31	1.78 : 1
	2 L.V.	0.54-0.56	0.55	0.29-0.30	0.30	1.86 : 1
Antepenultimate	2 R.V.	0.49	0.49	0.29	0.29	1.70 : 1
Instar minus one	1 L.V.	0.47	0.47	0.27	0.27	1.74 : 1
Antepenultimate	1 R.V.	0.36	0.36	0.23	0.23	1.57 : 1
Instar minus two						

Although insufficient of the earlier instars occur to give a good statistical sample, some interesting facts emerge. In the adult, both the length and height of the right valve is greater than the left. In the penultimate growth stage, the left valve is longer but less high than the right. In all cases the length : height ratio is greater in the left than in the right valve.

REMARKS. The species is very variable in shape and size. Specimens from the

*coronatum* zone of Brora are larger and proportionally higher than those from the *athleta* zone of Woodham ; those from the *athleta* zone of Staffin Bay have a more convex dorsal and a straighter ventral margin than those from Brora. These variations are here considered to be acceptable within the plexus of a single species.

The present material is rather larger, with minutely punctate shell surface, than that recorded by Bate (1963) from the Middle Bajocian Kirton Shale of Lincolnshire (L. 0.69-0.71 ; H. 0.35-0.39)

Suborder **PODOCOPINA** Sars 1866

Superfamily **BAIRDIACEA** Sars 1888

Family **MACROCYPRIDIDAE** Muller 1912

Genus **MACROCYPRIS** Brady 1867

*Macrocypris aequabilis* Oertli 1959

Plate 1. Figs. 17, 19, 21, 26.

1959 *Macrocypris aequabilis* n. sp. Oertli : 24, pl. 2, figs. 74-82.

1963 *Macrocypris (Macrocypris) ? aequabilis* Oertli 1959. Plumhoff : 18, pl. 1, figs. 4-8.

1964 *Macrocypris aequabilis* Oertli 1959. Glashoff : 30.

**MATERIAL.** 6 valves and carapaces.

**DISTRIBUTION.** Occurring in the *mariae* zone of Staffin Bay and Port-an-Righ and also in the *mariae* and *cordatum* zones in England.

**DIMENSIONS.** From sample OC-Ox-Pn-23, *mariae* zone, Purton brickpit, near Swindon, Wilts.

		Length	Height	Width
R.V.	Io.5038	0.36	0.16	0.08
Carapace	Io.5039	0.41	0.19	0.12

**REMARKS.** This species has been recorded from Britain before by Glashoff, 1964, from the *pseudocordata* zone of Yorkshire, and the *cymodoce* zone of Dorset. 10-12 anterior radial pore canals have been identified in the British material.

Subfamily **CYPRIDACEA** Baird 1845

Family **PARACYPRIDIDAE** Sars 1923

Genus **PARACYPRIS** 1866

*Paracypris* sp. A.

Plate 1. Figs. 20, 22, 23, 29.

**MATERIAL.** 49 valves and carapaces, mostly crushed and very poorly preserved.

**DISTRIBUTION.** Almost exclusively a Scottish species, occurring in the *coronatum* zone at Brora, the *mariae* zone at Port-an-Righ, and in the *lamberti* and *mariae* zones

at Staffin Bay. It also occurs in one sample from the *lamberti* zone of Tidmoor point, near Weymouth, Dorset.

DIMENSIONS. OC-Ox-SB-81, *mariae* zone Staffin Bay.

		Length	Height	Width
Carapace	HU.16.J.29	0.85	0.39	0.28

DESCRIPTION. Large, Slightly bow-shaped, elongate. Left valve considerably larger than right with overlap all round, strongest ventrally. Anterior margin rounded; posterior acuminate with apex below mid-height. The dorsal margin is strongly arched; ventral margin medianly concave. Greatest length just below mid-height; greatest height and width antero-medianly. Valve surface minutely punctate. Anterior marginal area broad with a large vestibulum. Hinge simple with a narrow dorsal ridge in the right and a shallow complementary groove in the left valve.

REMARKS. This species is left with nomina aperta, because the poorly preserved nature of the material renders a complete description impossible. It differs from most other Jurassic members of the genus in being only slightly acuminate posteriorly and with the posterior apex only just below mid-height instead of being sub-ventral. It appears to be closest to *Paracypris*? sp. 2041, described by Grekhoff (1963) from the Lower Callovian of Madagascar.

Family PONTOCYPRIDIDAE G. W. Müller 1894

Genus ARGILLOECIA Sars 1866

*Argilloecia* (?) sp. A.

Plate I. Figs. 24, 25, 27, 28.

MATERIAL. One carapace from sample OC-Ox-P.a.R.-50a, *mariae* zone, Port-an-Righ.

DIMENSIONS.

		Length	Height	Width
Carapace	Io.5040	0.53	0.25	0.21

DESCRIPTION. Medium. Subrectangular, elongate. Left valve larger than right, with slight dorsal and very strong ventral overlap. Anterior margin well-rounded with extremity at mid-height. Dorsal margin arched; ventral with slight median concavity. Cardinal angles prominent. Greatest length below mid-height; height medially; width postero-medianly. Valve surface minutely punctate. Muscle scars seen through the shell consist of a close group of 5 scars with three anteriorly and 2 behind.

REMARKS. Insufficient material requires that this species be left with open nomenclature. It differs from other species of *Argilloecia* in being less acuminate posteriorly, less arched dorsally, and in having the left valve rather than the right as the larger valve. However, because the muscle scar pattern is so similar to that of the type species of *Argilloecia*, the specimen is tentatively included in this genus.

Family **KRAUSELLIDAE** Berdan 1961Genus **KRAUSELLA** Ulrich 1894

REMARKS. *Krausella* is here considered to belong to the Cypridacea and the monotypic family Krausellidae, rather than to the Healdicea of the Metacopina. This change of taxonomic position is based on the nature of the muscle scars which resemble more closely the cyprid than any other type. A substantiation of this change will be embodied in a later paper on the Oxfordian Ostracods of southern England in which a large fauna of *Krausella* will be described.

*Krausella* sp. A

Plate 2. Figs. 1, 2, 5, 6.

MATERIAL. 5 carapaces. From the coronatum zone of Brora, the *mariae* zone of Port-an-Righ, and also from the Corallian, *cautisnigrae* zone of the Dorset Coast.

DIMENSIONS. OC-Call-Ba-87. *coronatum* zone, Brora.

		Length	Height	Width
Carapace	10.5041	0.54	0.27	0.25

DESCRIPTION. Medium. Elongate, oval. Pointed posteriorly. Elliptical in dorsal view. Left valve considerably larger than right with overlap all round except posteriorly where the strongly pointed posterior margin of the right valve projects beyond the left. Anterior margin narrowly rounded. Dorsal margin arched; ventral margin gently convex. Greatest length just below mid-height; greatest height and width median. Valve surface smooth. Internal features not seen.

REMARKS. This species differs from *K. argoviensis* Oertli 1959, in its smaller size and less rectangular outline.

Superfamily **CYTHERACEA** BairdFamily **SCHULERIDEIDAE** Mandelstam 1959Subfamily **SCHULERIDEINAE** Mandelstam 1959Genus **PRAESCHULERIDEA** Bate 1963*Praeschuleridea batei* n. sp.

Plate 2. Figs. 3, 4, 9-22.

1960 *Schuleridea* sp. 1. Lutze : 434, pl. 37, figs. 6, 8.

DIAGNOSIS. *Praeschuleridea* with strongly pitted ornament; pronounced sexual dimorphism; and considerable overlap of left over right valve.

HOLOTYPE. One male right valve. HU.17.J.6. Sample OC-Call-Ba-77, *coronatum* zone, Brora.

DERIVATO NOMINIS. In honour of Dr. R. H. Bate of the British Museum (Nat. Hist.), the author of the genus, in recognition of his valuable contribution to our understanding of Jurassic ostracods.

MATERIAL. 343 valves and carapaces.

DISTRIBUTION. Ranging from the *macrocephalus* to the *lamberti* zone, and occurring from the coast of Dorset to east Sutherlandshire. In Scotland, it occurs in abundance in the *coronatum* zone of Brora. In England, it occurs at a number of localities, mostly in the south, but never in the same abundance as at Brora.

#### DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Male R.V.	HU.17.J.6	0.77	0.40	0.19
PARATYPES From same sample				
Male R.V.	Io.5042	0.76	0.39	0.19
Male L.V.	Io.5043	0.79	0.45	0.21
Female R.V.	Io.5044	0.67	0.40	0.19
Female L.V.	Io.5045	0.72	0.45	0.21
Female Carapace	Io.5046	0.71	0.45	0.34
Male Carapace	Io.5047	0.83	0.44	0.35

DESCRIPTION. Medium to large. Sub-rectangular to sub-ovate. Left valve considerably larger than right with overlap all round. Both dorsal cardinal angles distinct in the right valve; in the left, the anterior is rounded. Anterior margin well rounded in left valve; in right valve with angle above mid-height. In both valves the anterior extremity is below mid-height. Posterior margin pointed, more so in right than in left valve; postero-ventral slope convex; postero-dorsal slope straight in left valve, slightly concave in right. Dorsal margin straight in right and convex in left, particularly in female valves which may be almost umbonate. Greatest height occurs medianly; width postero-ventrally. Instars smooth. Adult strongly pitted on lateral surface. Marginal borders smooth and narrow. Normal pore canals fairly numerous. Marginal areas of medium width. Inner margin and line of concrescence coincide ventrally but diverge very slightly anteriorly and posteriorly. Radial pore canals fan shaped; 12 antero-ventrally, the most dorsal of which are strongly upturned; 5-7 posteriorly. Hinge paleohemimerodont (Bate 1963). In the right valve, the terminal elements are elongate dentate ridges with five smooth, evenly spaced teeth anteriorly and 6 posteriorly. The median element is a smooth narrow ridge which is lowest and narrowest medianly. This ridge is bounded dorsally by a narrow groove which is in turn bounded dorsally by the slightly over-turned edge of the valve. The median element is negative in the sense that it does project the line of commissure when viewed dorsally. In the left valve the terminal loculate sockets are open distally and above the median element is a broad accommodation groove. Muscle scars consist of a vertical row of 4 adductors, with a large oval anterior and a smaller antero-ventral scar. Sexual dimorphism conspicuous, the male valves being longer, proportionally less high and more parallel-sided than the females.

REMARKS. This species is very common in the Callovian of Britain and is almost certainly conspecific with *Schuleridea* sp. r. described by Lutze (1960) from the *jason* zone of Hildersheim. It differs from *Praeschuleridea caudata* (Donze and Enay 1962), the only other known species from above the Bathonian, in its pitted ornament, larger size and less acuminate posterior. From the type, *P. subtrigona* (Jones and Sherborn 1888), it differs in its larger size, more pronounced sexual dimorphism and pitted ornament. It is considerably larger than either *P. lepida* or *P. wartae* Blaszyk 1967. *P. mediopunctata*, Dreyer 1967 is much smaller and more ovate.

Family **BYTHOCYTHERIDAE** Sars 1926

Genus **MONOCERATINA** Roth 1928

***Monoceratina scrobiculata*** Triebel and Bartenstein 1938

Plate 3. Figs. 1-7, 9, 10.

- 1938 *Monoceratina scrobiculata* n. sp. Triebel and Bartenstein : 508-509, pl. 1, fig. 5, pl. 2, fig. 6.  
 1958 *Monoceratina scrobiculata* Triebel and Bartenstein 1938. Bizon : 23.  
 1959 *Monoceratina scrobiculata* Triebel and Bartenstein 1938. Oertli : 25, pl. 4, figs. 92-95.  
 1960 *Monoceratina* cf. *scrobiculata* Triebel and Bartenstein 1938. Lutze : 433, pl. 37, fig. 7.  
 1962 *Monoceratina scrobiculata* Triebel and Bartenstein 1938. Fischer : 335, pl. 19, figs. 10-12.  
 1963 *Monoceratina scrobiculata* Triebel and Bartenstein 1938. Oertli : pls. XXV, 2., XXXVI.  
 1964 *Monoceratina scrobiculata* Triebel and Bartenstein 1938. Glashoff : 37-38.  
 non 1963 *Monoceratina* sp. cf. *M. scrobiculata* Triebel and Bartenstein 1938. Bate, 1963a : 190, pl. 4, figs. 1-4.

MATERIAL. 456 valves and carapaces. Ranging from the *coronatum* to the *plicatilis* zone and occurring from Dorset to N.E. Scotland. In Scotland it occurs in the *coronatum* zone at Brora, the *mariae* zone at Port-an-Righ, and in the *lamberti* and *mariae* zones at Staffin Bay. The species is of widespread occurrence in England.

DIMENSIONS. OC-Ox-Wm-I. From the *mariae* zone of Woodham brickpit.

		Length	Height	Width
R.V.	10.5048	0.80	0.37	0.35
L.V.	10.5049	0.70	0.35	0.28
Carapace	10.5050	0.67	0.34	0.49

The dimension of width includes the spine.

REMARKS. This species has been recorded twice before from this country, by Lutze, 1960 from the *athleta* zone of Crook Hill brickpit Dorset, and from the *mariae* zone of Woodham brickpit; and by Glashoff 1964 from the *cordatum* zone of Huntingdonshire and from the Dorset coast. The present record from the *plicatilis* zone of the Dorset zone, is the highest for the species.

*Monoceratina stimulea* (Schwager 1866)

Plate 3. Figs. 8, 11-17.

- 1866 *Cythereis stimulea* Schwager M.S., Opper & Waagen : 276, fig. 1.  
 1938 *Monoceratina stimulea* (Schwager 1866) Triebel & Bartenstein 1938 : 505-506, pl. 1.  
 1960 *Monoceratina stimulea* (Schwager 1866) Fernet : pl. 2, figs. 8-9.  
 1962 *Monoceratina stimulea* (Schwager 1866) Fischer : 334, pl. 19, figs. 8-9.  
 ? non 1959 *Monoceratina cf. stimulea* (Schwager 1866) Oertli : 27, pl. 4.  
 ? non 1964 *Monoceratina cf. stimulea* (Schwager 1866) Glashoff : 38.

MATERIAL. 61 valves and carapaces. Occuring only in the *mariae* zone, from two localities, Port-an-Righ and Woodham, being more common at the latter.

DIMENSIONS. OC-Ox-Wm-3, the *mariae* zone Woodham brickpit.

		Length	Height	Width
R.V.	Io.5051	0.60	0.31	0.24
L.V.	Io.5052	0.60	0.32	0.23
Carapace	Io.5053	0.57	0.32	0.44

The dimension of width includes the spine.

DESCRIPTION. Medium. Subrectangular. Right valve slightly larger than left. Anterior margin well rounded with extremity at or just above mid-height ; posterior margin pointed sub-dorsally. Dorsal margin straight ; ventral margin posteriorly convex with a strong postero-ventral keel. Anterior cardinal angle more marked and more anterior in left than in right valve. Greatest height in posterior one third of valve ; width postero-ventrally. Valve surface smooth and shell thin and translucent. There is a prominent median sulcus and large ventro-laterally directed spine arising ventro-medianly. This spine is smooth except for annular costae and reticulæ at its base. Marginal areas rather wide for the genus. Small vestibula at each end. Hinge adont, with a narrow smooth groove in the right valve, bounded dorsally and ventrally by smooth ridges and a complementary smooth bar in the left valve. The central muscle scars are situated on a median ridge, the internal reflection of the median sulcus, and consist of a crescentic line of five scars. Anterior scars not seen.

REMARKS. This is the first record of the species from Britain. Oertli's 1959 record of *M. cf. stimulea* would seem to be better considered as *M. vulsa* (Jones & Sherborn) : and similarly the record from the Yorkshire *cautisnigrae* (Glashoff 1964) since although not figured, he remarks on the similarity of this to Oertli's 1959 material.

*Monoceratina vulsa* (Jones & Sherborn 1888)

Plate 3. Figs. 18-25.

- 1888 *Cytheridea vulsa* Jones & Sherborn : 263, pl. 2, fig. 4.  
 1938 *Monoceratina vulsa* (Jones & Sherborn 1888). Triebel & Bartenstein : 516, pl. 3, figs. 17-18.  
 ? 1959 *Monoceratina cf. stimulea* (Schwager 1866). Oertli : 27, pl. 4, figs. 96-97.  
 1960 *Monoceratina cf. vulsa* (Jones & Sherborn 1888). Lutze : 433, pl. 37, fig. 5.

- 1963 *Monoceratina* sp. juv. aff. *vulsa* (Jones & Sherborn 1888). Plumhoff : 48, pl. 11, figs. 167-168.  
 1963 *Monoceratina vulsa* (Jones & Sherborn 1888). Bate (1963b) 26, pl. 1, fig. 6.  
 1963 *Monoceratina vulsa* (Jones & Sherborn 1888). Oertli : XXXII, 2.  
 1964 *Monoceratina vulsa* (Jones & Sherborn 1888). Bate : 9.  
 ? 1964 *Monoceratina* cf. *stimulea* (Schwager 1866). Oertli 1959. Glashoff : 38.  
 1967 *Monoceratina* cf. *vulsa* (Jones & Sherborn 1888). Blaszyk : 68, 69, pl. 10, fig. 4.  
 1969 *Monoceratina vulsa* (Jones & Sherborn). Bate : 400 and 401, pl. 7, fig. 5.

MATERIAL. 122 valves and carapaces. Occurring widely throughout Britain and ranging from the *macrocephalus* to the *plicatilis* zones, being most abundant in the *athleta* zone. In Scotland it occurs in the *mariae* zone at Port-an-Righ, and in the same zone at Staffin Bay.

DIMENSIONS. OC-Call-Wm-24, *athleta* zone, Woodham.

		Length	Height	Width
R.V.	Io.5054	0.64	0.29	0.16
L.V.	Io.5055	0.63	0.28	0.15
Carapace	Io.5056	0.65	0.29	0.27

REMARKS. This species is similar in shape and size to *M. unguлина* Triebel & Bartenstein 1938, but differs in being ornamented, the latter being smooth. Although very little variation is shown throughout the range of the present material, there is a tendency for later forms to be less ornamented than those from lower horizons. None of the present specimens are as strongly pitted as the type material.

### *Monoceratina* sp. A.

Plate 3. Fig. 26.

MATERIAL. 3 broken valves. From Sample OC-Call-SB-71 *lamberti* zone, Staffin Bay.

REMARKS. These specimens are very similar to *M. vulsa* (Jones & Sherborn), but differ in possessing 4 strong marginal spines at the anterior cardinal angle. A number of very narrow radial pore canals are seen anteriorly, where there is a strong vestibule. This would appear to be a new form, perhaps a subspecies of *M. vulsa*. It is left with open nomenclature at present because of inadequate material.

Family CYTHERIDEIDAE Sars 1925

Subfamily CYTHERIDEINAE Sars 1925

Genus *GALLIAECYTHERIDEA* Oertli 1957

*Galliaecytheridea staffinensis* n. sp.

Plate 4. Figs. 1-6.

DIAGNOSIS. *Galliaecytheridea* with thick shell and strongly pitted and punctate ornament. Posterior cardinal angle distinct ; posterior margin pointed at mid-height. Strongly inflated medianly and with left valve strongly overlapping right.



HOLOTYPE. One carapace HU.18.J.8, sample OC-Ox.SB.94, *cordatum* zone, Staffin Bay, to which locality and zone, the species would appear to be restricted.

MATERIAL. 20 valves and carapaces.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Carapace	HU.18.J.8	0.77	0.51	0.36
PARATYPE	From same sample.			
Carapace	Io.5058	0.80	0.51	0.35

DESCRIPTION. Large. Subrectangular to subquadrate. Mean length : height ratio 1.59 : 1. Elliptical in dorsal view, end margins laterally compressed particularly anteriorly. Left valve larger than right with conspicuous overlap. Anterior margin well-rounded; posterior pointed at mid-height, with a convex postero-ventral and a straight or slightly concave postero-dorsal slope. Anterior cardinal angle rounded; posterior distinct. Dorsal margin short and slightly concave, ventral margin gently convex, upturned posteriorly. Greatest length at mid-height; height, at the anterior cardinal angle; width, postero-median. Valve surface pitted to punctate with smooth marginal borders and strong antero-marginal furrow. Normal pores large and fairly numerous. Marginal areas rather narrow; line of concrescence and inner margin coincident throughout. Radial pore canals short and straight with 12-14 anteriorly and 4 posteriorly. Hinge hemimerodont, only seen in fragmentary valves. In the left valve, the anterior terminal element is a loculate socket with 5 locules, which is overhung dorsally and open both proximally and distally. No other part of the hinge seen, except for a small part of the median element, a smooth bar. Muscle scars a vertical line of four adductors with a heart-shaped anterior and a smaller antero-ventral scar.

REMARKS. This species most closely resembles *G. wolburgi* (Steghaus 1951), but differs in being more heavily ornamented, more parallel sided and inflated.

Genus *GLABELLACYTHERE* Wienholz 1967

*Glabellacythere reticulata* n. sp.

Plate 4. Figs. 7-15, Plate 5, Figs. 1-6.

1962 Ostracod No. 138 Brand. Brand and Fahrion : 153, pl. 21. figs. 37-38.

DIAGNOSIS. *Glabellacythere* characterized by the possession of strongly reticulate ornament and very pronounced sexual dimorphism.

HOLOTYPE. One female carapace, HU.18.J.11, from sample OC-Call-Sb-72, *lamberti* zone Staffin Bay, Isle of Skye.

DERIVATO NOMINIS. From the reticulate nature of the ornament.

MATERIAL. 72 valves and carapaces.

DISTRIBUTION. Wide spread in the Callovian of southern England and in Scotland occurring in the *coranatum* zone Brora and in the *lamberti*, *mariae* and *cordatum* zones of Staffin Bay.

DIMENSIONS. Sample OC-Call-SB-72, *lamberti* zone, Staffin Bay.

HOLOTYPE		Length	Height	Width
Female Carapace	HU.18.J.11	0.67	0.35	0.39
PARATYPES Same sample as holotype.				
Female R.V.	Io.5060	0.67	0.35	0.20
Female L.V.	Io.5061	0.67	0.36	0.21
Male R.V.	Io.5062	0.77	0.34	0.21
Male L.V.	Io.5063	0.80	0.35	0.21
Male carapace	Io.5064	0.76	0.33	0.35

DESCRIPTION. Medium to large. Sub-rectangular. Strongly inflated postero-medially, laterally compressed at each end. Left valve larger than right with overlap at the cardinal angles. Cardinal angles both angular in the left valve ; in the right, particularly males, the posterior cardinal angle is more rounded. Anterior margin rounded in right valves ; more angular in left. Extremity below mid-height. Posterior margin bluntly pointed in left valve ; more pointed in right with a convex postero-ventral and a concave postero-dorsal slope. Dorsal margin slightly concave medially with a small anterior hinge ear ; ventral margin with slight median concavity. These margins sub-parallel, particularly in male valves. Greatest length at mid-height ; height at the anterior cardinal angle ; width in posterior third. Marginal borders smooth. Lateral surface coarsely reticulate. Ventrally, the ridges whose ramifications give rise to the reticulations, become aligned parallel to the ventral margin as a series of weak ridges. A flange frill borders the anterior margin. Eye spot small, better developed in right than left valve. Normal pores few. Marginal areas of medium width, small vestibula occur at each end. Radial pore canals thin, straight and widely spaced ; 6 anteriorly and 3-4 posteriorly. Hinge antimerodont. In the right valve the terminal elements are raised dentate ridges with 5 teeth anteriorly and 6 or 7 posteriorly. The median element is a locellate groove ; open ventrally and closed dorsally by a ridge which itself contains a shallow groove. Complementary structures occur in the left valve hinge where the terminal elements are open distally. A weak shelf-like accommodation groove occurs above the hinge in the left valve. Muscle scars consist of 4 equal sized adductors in a vertical line, and a large oval anterior and smaller antero-ventral sear. Sexual dimorphism strongly pronounced, the males being longer and proportionally less high than the females.

REMARKS. This species differs from *G. dolabra* (Jones & Sherborn) in its strongly developed ornament and sexual dimorphism.

*Glabellacythere dolabra* (Jones & Sherborn)

Plate 5. Figs. 7-18.

- 1888 *Cytheridea dolabra* Jones & Sherborn : 267, pl. 3, figs. 3a-c.  
 1888 *Cytheridea puteolata* Jones & Sherborn : 259, pl. 1, figs. 7a-c.  
 1888 *Cytheridea parallela* Jones & Sherborn : 260, pl. 1, figs. 9a-c.  
 1888 *Cytheridea pentagonalis* Jones & Sherborn : 261, pl. 2, figs. 1a-c.  
 1888 ?*Cytheridea ignobilis* Jones & Sherborn : 268, pl. 3, figs. 9a-c.  
 1967 *Glabellacythere nuda* n. sp. Wienholz : 31, pl. 3, figs. 32-34 ; pl. 4, fig. 35.  
 1969 *Hadrocytheridea dolabra* (Jones & Sherborn) Bate : 407-409, pl. 9, figs. 1-8, pl. 10, fig. 1 ;  
 Text-fig. 7.

MATERIAL. 112 valves and carapaces.

DISTRIBUTION. Occurring from Dorset to Skye and ranging from the *macrocephalus* to the *cordatum* zone. In Scotland, occurring in the *lamberti* zone of Staffin Bay.

DIMENSIONS. From Sample OC-Call-CH-14, *athleta* zone, Crook Hill.

		Length	Height	Width
Female R.V.	Io.5065	0.64	0.35	0.20
R.V.	HU.18.J.18	0.67	0.35	0.20
L.V.	Io.5066	0.67	0.37	0.20
Carapace	Io.5067	0.65	0.37	0.33

REMARKS. Sexual dimorphism, rarely expressed, is confined to the presence of a few broken male valves, found in the earlier part of the range of the species. The presence of small vestibula in this material contrasts it with the Bathonian species. Instars are rare amongst the Scottish material, and the ontogeny of *G. dolabra* will be discussed in a later paper in which the English Ostracoda of this age are described. This species bears a strong external, but entirely superficial resemblance to *Dolocytthere maculosa* Bate. Bate (1969) erected the genus *Hadrocytheridea* to accommodate this species and earlier Wienholz (1967) had erected the genus *Glabellacythere* based upon the same species which she called *nuda*<sup>1</sup>. The present author has followed Bate in assigning this species to the *Cytherideinae* rather than the *Progonocytherinae* as favoured by Wienholz.

## Family CYTHERURIDAE G. W. Müller 1894

Genus *PROCYTHERURA* n. gen.

TYPE SPECIES. *Procytherura tenuicostata* n. sp.

DIAGNOSIS. Similar in shape to *Cytherura* Sars. Small. Valves subequal, right slightly higher than left. Weakly sulcate antero-medially. Ornament variable from almost smooth to wrinkled or costate. Radial canals straight and thin, thickened proximally. Hinge lophodont, the terminal elements in the right valve being smooth narrow ridges. Eye spot weak. Narrow vestibula occur at each end. Muscle scars of 4 adductors with a single large heart-shaped anterior scar.

<sup>1</sup> See Addendum

REMARKS. *Procytherura* is considered to be ancestral to *Cytherura* Sars. The shape of the two genera is very similar and in both the right valve overhangs the left dorsally. The main differences are in the hingement, muscle scars and marginal areas. In *Cytherura*, the hinge is "hemimerodont", in *Procytherura* it is lophodont. Vestibula are absent in *Cytherura* and prominent in *Procytherura*; in the former the anterior scars consist of an oval scar with an oblique elongate scar and a smaller circular scar anterior to it, in the latter there is a single heart-shaped anterior scar. From *Vesticlytherura* Grondel, this genus differs in shape ornament and hingement. Of the species described as *Cytherura* by Oertli (1957, 1959), from the Upper Oxfordian of France and Switzerland, none would appear to belong to *Procytherura*. Dr. Oertli has been kind enough to send specimens of most of these, and *C. ? lacrimula* and *C. liesbergensis* certainly do not belong here, but probably to a new genus within the family. *Monoceratina sundancensis* Swain and Peterson 1951, may belong in *Procytherura*, as its shape and ornament are very similar. *Cytherura bathonica* and *C. mediojurassica* Bate 1969 may well belong to *Procytherura* but as they are only known as carapaces it is not possible to be certain.

*Procytherura tenuicostata* n. sp.

Plate 6. Figs. 1-8. Text fig. 6 a-d.

DIAGNOSIS. *Procytherura*, with shape and ornament very similar to the type of *Cytherura*. Hinge lophodont and weakly developed. Vestibula at each end. Muscle scars a vertical line of 4 adductors with a single heart-shaped anterior scar.

HOLOTYPE. One left valve HU.18.J.30. Sample COR-DC-16, top of Nothe Clay, *plicatilis* zone, Corallian of the Dorset Coast.

DERIVATO NOMINIS. From the weakly ornamented nature of the carapace.

MATERIAL. 114 valves and carapaces.

DISTRIBUTION. Widespread throughout the English Oxfordian, ranging from the *mariae* to the *pseudocordata* zone. In Scotland it occurs in the *plicatilis* zone at Port-an-Righ.

DIMENSIONS

		Length	Height	Width
HOLOTYPE				
L.V.	HU.18.J.30	0.39	0.16	0.10
PARATYPES	Same sample as holotype.			
		Length	Height	Width
R.V.	10.5068	0.36	0.16	0.10
R.V.	10.5069	0.36	0.16	0.10
L.V.	10.5070	0.35	0.19	0.10
Carapace				
[specimen lost]	HU.18.J.34	0.36	0.20	0.16

DESCRIPTION. Very small, thin-shelled. Subrectangular, elongate. Valves subequal, right overreaching left dorsally. Slightly bilobed in dorsal view due to weak median sulcus. Anterior margin rounded; posterior produced into a caudal process with a blunt apex above mid-height. Dorsal margin straight, anterior cardinal angle slightly more prominent in left than in right valve. Ventral margin with shallow median concavity and well-developed postero-ventral keel, especially in right valve. Greatest length above mid-height; height at the anterior cardinal angle; width in posterior third. Ornament variable from smooth to wrinkled or weakly reticulate. Normal pore canals few, small and widely spaced. Eye spot small and not prominent. Marginal areas of variable width, narrow vestibula occur at each end. Selvage strongly developed ventrally and flange anteriorly. Radial pore canals straight, thin with proximal thickening, 5 anteriorly, 2-3 posteriorly. Hinge lophodont with weak terminal elements. In the right valve, the median element is a shallow smooth to feebly locellate groove which widens distally and which passes dorsal to the proximal parts of the terminal elements which are low weak smooth ridges. The groove is bounded dorsally by the edge of the valve and is open ventrally in its mid-part. Complementary structures occur in the left valve, where a weak shelf-like accommodation groove may be present. Muscle scars consist of a sub-central line of 4 adductors, with a large heart-shaped anterior scar.

REMARKS. The amount of variation in the ornament exhibited by this species is considerable. Some forms are smooth, others weakly reticulate. There appears to be no trend associated with this variation which occurs in any population at any horizon. A further species of this genus, from the Callovian of Dorset will be described in a later paper. *P. tenuicostata* differs from both *Cytherura bathonica* and *C. mediojurassica* Bate in its weaker ornament.

Genus *EUCYTHERURA* G. W. Müller 1894

Subgenus *VESTICYTHERURA* Gründel 1964

*Ecytherura (Vesticytherura) costaeirregularis* n. sp.

Plate 6. Figs. 9-19, 21.

DIAGNOSIS. *Vesticytherura* with ornament of impersistent and irregular ribs and variable intervening reticulae. Eye tubercle rib biramous. Median and dorsal ribs either main separate or only tenuously linked posteriorly.

HOLOTYPE. One left valve HU.18.J.40 from sample AC-Mel-5, 5 feet below the main stone band, Ampthill Clay, *cautisnigrae* zone, Melton, Yorks.

DERIVATO NOMINIS. From the irregular expression of the ribs.

MATERIAL. 189 valves and carapaces.

DISTRIBUTION. Occurring in the *coronatum* zone of Brora, the *lamberti* and *mariae* zones of Staffin Bay and the *mariae* zone of Port-an-Righ, and widely distributed between the *macrocephalus* and *plicatilis* zones in England.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
L.V.	HU.18.J.40	0.35	0.21	0.11
		Length	Height	Width
PARATYPES. Same sample as holotype.				
R.V.	Io.5071	0.35	0.18	0.09
L.V.	Io.5072	0.36	0.21	0.10
L.V.	Io.5073	0.34	0.20	0.10
R.V.	Io.5074	0.36	0.19	0.09
Carapace	Io.5075	0.35	0.21	0.17

DESCRIPTION. Very small. Subquadrate to subrectangular. Slightly bilobate in dorsal view due to the possession of a weak antero-medial sulcus. Left valve larger than right with slight dorsal overlap. Anterior margin of right valve rounded, that of left more angular. Anterior cardinal angle stronger and more anterior in left than in right valves. Posterior margin produced into a sub-dorsal caudal process with a rather blunt apex. Dorsal margin straight in left and slightly convex in right valves. Ventral margin straight, strongly upturned posteriorly. Greatest height at the anterior cardinal angle; length, sub-dorsally; width, in the posterior third.

Surface ornament of rather weak, impersistent and irregular ribs with very variable intercostate ornament. There are two short ventral ribs. From a postero-ventral prominence, a short rib extends antero-ventrally for a short distance before changing direction antero-dorsally to its termination, ventral to an antero-medial position. This rib is rather variable, but its overall 'V' shape is characteristic of the species. A weak and very variable median rib occurs, which may or may not be joined by a dorsal extension, to the dorsal rib. In some cases this rib may be terminated medianly, in others it may extend onto the anterior marginal border. The dorsal rib extends from a postero-dorsal position, along the dorsal margin, and may be terminated either anterior or posterior to the eye tubercle. The eye tubercle is circular, glassy and prominent. From it a short rib extends antero-ventrally to the marginal border, and another ventrally which may or may not join the median rib. A variable number of small irregular ribs also occur. The intercostate areas vary from reticulate to almost smooth. Three large tubercles occur at the base of the caudal process and a large number of small tubercles occur randomly. Five strong marginal denticles occur anteriorly. Normal pores few, large and well spaced. Marginal areas wide. Large vestibula occur at each end. Radial pores slightly sinuous, widely spaced and thickened proximally; 5 anteriorly and 3-5 posteriorly. Hinge with right valve terminal elements consisting of a single smooth circular or oval tooth at each end, connected by a locellate groove. Complementary structures occur in the left valve hinge, above which is a shelf-like accommodation groove. There are four vertically aligned adductor scars and a large oval anterior scar.

REMARKS. This species is most closely related to *E. (V.) gruendeli* (n. sp. in press) which occurs widely in the English Oxfordian and which will be described in a later work.

*Eucytherura (Vesticytherura) horrida* n. sp.

Plate 6. Figs. 20, 22-24, Plate 7, Figs. 1-6.

DIAGNOSIS. A new species of *Vesticytherura* whose ornament is the product of an interaction of coarse irregular ribs and tubercules.

HOLOTYPE. One left valve, HU.18.J.50, sample OC-Ox-Wm-1, *mariae* zone three feet above the base, Woodham brickpit, Oxfordshire.

DERIVATO NOMINIS. L. rough ; pertaining to the rough tuberculate and spinose nature of the surface ornament.

MATERIAL. 21, valves and carapaces.

DISTRIBUTION. Occurring in the *lamberti* and *mariae* zones of Staffin Bay, and in England at similar levels.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
L.V.	HU.18.J.50	0.36	0.20	0.12
PARATYPES	Same sample as holotype.			
L.V.	Io.5076	0.35	0.20	0.09
R.V.	Io.5077	0.36	0.21	0.12
Carapace	Io.5078	0.35	0.19	0.19

DESCRIPTION. Very small. Subquadrate. Left valve slightly larger than right with dorsal overlap. Slight median sulcus. Anterior margin rounded ; posterior margin produced into a caudal process with apex at mid-height and with convex postero-ventral and concave postero-dorsal slope. Dorsal margin straight, ventral margin with slight median concavity. Greatest length above mid-height ; height, at the anterior cardinal angle ; width, postero-ventrally. Ornament consisting of irregular ribs, tubercules and reticulations. An elevated alate prominence, surmounted by an irregular tubercule, occurs postero-ventrally. A similar feature occurs postero-dorsally and overhangs the dorsal margin, in some cases being produced into a dorsal rib. An irregular postero-median tubercule is developed in some specimens. The eye spot is surmounted by an irregular rib which may extend beyond the dorsal margin. A weak ventral rib occurs. The remainder of the valve surface is reticulate and irregularly tuberculate. Five or six strong marginal denticles occur anteriorly. Marginal areas wide with vestibula at each end. Radial pore canals thickened proximally ; 5 anteriorly and 2 posteriorly. Hinge of right consists of a single smooth terminal tooth at each end, connected by a locellate groove. Complementary structures occur in the left valve hinge, above which is a weak, shelf-like accommodation groove. There are four vertically disposed adductors and a single oval anterior schar.

REMARKS. This species differs from others of the genus in the irregular and tuberculate nature of the ornament. It is rather larger and lacks the prominent mid-dorsal tubercule of *E. (V.) multituberculata* Gründel 1964, from the German Albian. The species forms a useful marker for the *lamberti* and the lower part of the *mariae* zones.

*Eucytherura (Vesticytherura) scottia* n. sp.

Plate 7. Figs. 7-13.

DIAGNOSIS. A new species of *Vesticytherura* with ornament of broad smooth ribs and low smooth tubercules. Intercostate areas smooth or weakly reticulate.

HOLOTYPE. One left valve, HU.18.J.36, sample OC-Ox-SB-87, *cordatum* zone, Staffin Bay.

DERIVATO NOMINIS. L. From the apparent restriction of the species to the Jurassic of Scotland.

MATERIAL. 28 valves and carapaces.

DISTRIBUTION. Occurring in the *coronatum* zone of Brora, and the *mariae* and *cordatum* zones of Staffin Bay.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
L.V.	HU.18.J.37	0.39	0.21	0.11
PARATYPES	Sample OC-Call-Ba-86, <i>coronatum</i> zone, Brora.			
Carapace	Io.5079	0.39	0.22	0.17
Carapace	Io.5080	0.37	0.22	0.16

DESCRIPTION. Very small. Subquadrate to subrectangular. Left valve slightly larger than right with dorsal overlap. Anterior margin poorly rounded with extremity below mid-height; posterior margin pointed in right and bluntly rounded in left, apex above mid-height. Posterior cardinal angle pronounced in both valves; anterior more rounded in right than left. Dorsal margin with slight median convexity; ventral medianly straight, upturned posteriorly. Greatest height at the cardinal angles; width, postero-ventrally; length, above mid-height. Ornament variable, consisting of a series of broad longitudinal ribs and swellings, and with either smooth or reticulate intervening areas. A broad, posteriorly alate rib, extends from a postero-ventral position across the ventro-lateral surface of the valve, terminating antero-ventrally. A similar broad, rib, which is broken mid-dorsally, extends along the dorso-lateral surface. The eye tubercle is well developed and is connected to a large smooth mid-anterior tubercle by a short rib. A further tubercle occurs ventral to the latter. Intercostate areas are variable smooth or reticulate. Small marginal denticles occur anteriorly. Normal pores few and widely spaced. Marginal areas wide, with large vestibula at each end. Radial canals thickened proximally; 5 anteriorly and 2 posteriorly, the latter may branch. Flange well developed anteriorly. Right valve hinge consisting of two small oval terminal teeth connected by a finely locellate groove, with complementary structures in the left valve. There is no accommodation groove.

REMARKS. This species most closely resembles *Eucytherura ansata* Weingeist 1949, from the American Cretaceous, but differs in possessing a dorsal rib, rather than three isolated dorsal tubercules.



Genus *CYTHEROPTERON* Sars 1866

*Cytheropteron aquitanum* Donze 1960

Plate 7. Figs. 14-16.

- 1960 *Cytheropteron aquitanum* n. sp. Donze, 21-22, pl. 4, figs. 48-51.  
 1963 *Eocytheropteron aquitanum* (Donze 1960). Oertli, pl. XLVIII.  
 1969 *Cytheropteron aquitanum* Donze, Kilenyi : 141, pl. 28, figs. 8-11.

MATERIAL. One complete left valve and three fragments.

DISTRIBUTION. From the *coronatum* zone of Brora, and also from the *plicatilis* zone of Dorset.

DIMENSIONS. *plicatilis*, Dorset, sample COR-DC-7.

		Length	Height
L.V.	10.5081	0.43	0.28

REMARKS. The small size of the present specimens is probably attributable to their being growth stages, the length of the holotype being 0.57. The two previous records are from the Kimmeridgian, and the present record is an extension of the range and the first record of the species from Britain. The single complete specimen from the *plicatilis* zone of Dorset seem to be an undoubted member of the species. The broken nature of the Scottish Callovian specimens, however, makes their correct identification somewhat conjectural. The species is returned to the genus *Cytheropteron* from *Eocytheropteron* as its hinge is more typical of the former as also is its alar development.

Genus *METACYTHEROPTERON* Oertli 1957

*Metacytheropteron sutherlandensis* n. sp.

Plate 7. Figs. 17-24.

DIAGNOSIS. *Metacytheropteron* with left valve longer than right. Ventral part of anterior margin rounded, projecting below ventral margin. Ornament of weak reticulations is longitudinally aligned. Weak eye tubercule and furrow in left valve. Hinge weak, antimerodont. Dimorphic.

HOLOTYPE. One male right valve, HU.19.J.12. Sample OC-Call-Ba-86. *coronatum* zone Brora.

DERIVATO NOMINIS. After the county of Sutherlandshire, to the Callovian shales of which the species is apparently restricted.

MATERIAL. 69 valves.

DISTRIBUTION. Occuring in 8 samples, all from the Fascally brickpit at Brora, *coronatum* zone.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Male R.V.	HU.19.J.12	0.55	0.27	0.16
PARATYPES Same sample as holotype.				
Male L.V.	Io.5082	0.55	0.26	0.16
Female L.V.	Io.5083	0.46	0.25	0.15

DESCRIPTION. Medium. Subrectangular, elongate. Thin-shelled. Dimorphic. Inflated postero-ventrally. Anterior margin straight antero-dorsally, rounded antero-ventrally and extending below the ventral margin, with extremity below mid-height. Posterior margin bluntly pointed with apex at mid-height. Dorsal margin straight; ventral medianly obscured by valve tumidity. Male valves more parallel-sided and less posteriorly convergent than females. Greatest length at mid-height; height, at anterior cardinal angle; width, in posterior third. Ornament of weak reticulations, the weak ridges which extend from these being longitudinally aligned dorso and ventro-laterally. Anteriorly there is a convergence of these ridges which meet at about mid-height. The extreme marginal borders are smooth. In the left valve, there is a weak eye tubercle with an oblique furrow behind it. Flange frill-like anteriorly. Normal pores few, large and widely spaced. Marginal areas very narrow. Line of concrescence and inner margin coincide throughout. Hinge antimerodont, feebly developed. In the right valve the terminal elements are very low and consist anteriorly of five small oval teeth with five of six posteriorly. The median element is a locellate groove, partly open ventrally and closed dorsally by the edge of the valve. Complementary structures occur in the left valve hinge, above which is a gutter-like accommodation groove. Muscle scars not seen. Sexual dimorphism pronounced, the males being larger, longer, and more parallel-sided than the females.

REMARKS. This species differs from the type, *M. elegans* Oertli from the French Kimmeridgian, in its smaller size, weaker and less longitudinally aligned ornament and in its weaker hinge. From *M. ? striatulum* Anderson 1964, this species differs in being more elongate and parallel-sided and in possessing a much less prominent anterior cardinal angle. *M. nannodes* Anderson 1964, from the Rhaetic, would appear from its very small size to belong to *Procytherura* n. gen., but as the original description does not mention internal features, it is not possible to be certain.

*Metacytheropteron* sp. A.

Plate 8. Figs. 1-4.

MATERIAL. 3 carapaces and one broken valve.

DISTRIBUTION. Found only in the *coronatum* zone at Brora.

DIMENSIONS. Sample OC-Call-Ba-76

		Length	Height	Width
Carapace	Io.5084	0.44	0.20	0.19

DESCRIPTION. Small. Subrectangular. Left valve slightly larger than right with greatest overlap ventrally. The right valve is slightly longer than the left and projects beyond it anteriorly. Anterior margin broadly rounded, most sharply antero-ventrally where it projects below the ventral margin. Posterior margin bluntly pointed at mid-height. Dorsal margin with slight median convexity; ventral margin concave. Surface sculpture of 8-10 longitudinal costae extending the length of the carapace, the most dorsal changing direction antero-ventrally in the anterior half of their extent. Internal features not seen.

REMARKS. This species differs from *M. sutherlandensis* n. sp. in being smaller and less inflated and in its much stronger costae. Insufficiency of material requires that the species be left with open nomenclature.

Genus *PEDICYTHERE* Eagar 1965

*Pedicythere anterodentina* n. sp.

Plate 8. Figs. 5-14.

DIAGNOSIS. *Pedicythere* with small circular terminal tooth in right valve. Ventro-lateral spine triangular in section with a sharp anterior leading edge and small secondary spines on the posterior. There is a strong postero-ventral marginal spine.

HOLOTYPE. One right valve HU.17.J.41 sample OC-Ox-wm-1, from the *mariae* zone of Woodham brickpit.

DERIVATO NOMINIS. Pertaining to the single anterior terminal tooth in the right valve.

MATERIAL. 15 valves and carapaces.

DISTRIBUTION. Occurring in the *mariae* zone of Port-an-Righ, and in the English *lamberti* and *mariae* zones.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
R.V.	HU.17.J.41	0.35	0.17	0.15
PARATYPES	Same sample as holotype.			
L.V.	Io.5085	0.36	0.17	0.20
R.V.	Io.5086	0.33	0.16	0.16
Carapace	Io.5087	0.32	0.16	0.29

The dimension of width includes the spine.

DESCRIPTION. Very small. Subquadrate with a strong ventro-lateral spine. Left valve slightly larger than right. Dorsal and ventral cardinal angles well marked anteriorly. Posterior margin produced into a slightly upturned caudal process, the apex of which may extend above the dorsal margin. Dorsal margin straight or slightly sinuous. Ventral margin straight, upturned posteriorly. There is a slight median sulcus. Greatest length dorsally; height, at the anterior cardinal angle; width, postero-ventrally. Valve surface smooth or minutely punctate. There is a

large ventro-lateral spine which is triangular in section, the anterior leading edge being sharp and the posterior being blunter and often bearing small, backward directed secondary spines. The length of the spine is 0.10. A strong rib extends along the dorsal margin and its anterior termination is marked by a round tubercule which may or may not be visual in function. A number of small tubercules occur along the anterior margin, which may also bear marginal denticulations. There is a conspicuous postero-ventral spine. Marginal areas wide, with narrow vestibula at each end. A number of long thin radial canals occur anteriorly. The hinge in the right valve consists of a long straight smooth furrow with a single anterior terminal tooth, the posterior terminal element being absent. Complementary structures occur in the left valve hinge above which is a shelf-like accommodation groove.

REMARKS. This species is placed in *Pedicythere* because of the great similarity in shape, size, ornament etc. It differs from the type, *P. tessae*, from the Lower Eocene London Clay, only in lacking a posterior terminal hinge element, *P. anterodentina* is thought to be an early ancestral form of the genus.

Family **PROGONOCYTHERIDAE** Sylvester-Bradley 1948

Subfamily **PROGONOCYTHERINAE** Sylvester-Bradley 1948

Genus **CAYTONIDEA** Bate 1965

*Caytonidea terrae-fullonicae* (Jones & Sherborn 1888)

Plate 2. Figs. 7, 8.

1885 *Cythereidea perforata* Terquem (Non Roemer) : 28, pl. lv, fig. 8.

1888 *Cythereidea terrae-fullonicae* sp. n. Jones & Sherborn : 258, pl. 1, fig. 5.

1969 *Caytonidea terrae-fullonicae* Jones & Sherborn; Bate : 410, pl. 10, figs. 2, 7, 8, pl. 11, figs. 1-3.

MATERIAL. 8 valves, mostly fragmentary. In Scotland occurring in the *coronatum* zone of Brora and in England in the Upper Cornbrash *macrocephalus* zone of Dorset and the *athleta* zone of Woodham brickpit.

DIMENSIONS. OC-Call-Ba-78, Brora.

		Length	Height	Width
L.V.	10.5088	0.61	0.32	0.20

REMARKS. The author has seen the original material in the British Museum, which is identical to the specimens here described. This is the first record of the species from above the Bathonian.

Genus **LOPHOCYTHERE** Sylvester-Bradley 1948

REMARKS. Subsequent to the original erection of the genus, a large number of species have been described. On grounds of ornament, these seem to fall into two distinct groups. On this basis, it is considered necessary and valuable to here subdivide the genus. The type species, *Lophocythere ostreata* (Jones & Sherborn), has an

ornament which consists of a strong ventral rib and a strong ventro-lateral rib which changes direction through 90 degrees antero-ventrally and extends to the eye tubercle. The valve surface dorsal to this rib is often strongly reticulate and bears a number of short thin ribs. The ornament is always the same in each valve. Species with this type of ornament, which include *L. scabra* s.l. Triebel 1951, are here retained as *Lophocythere*, subgenus (*Lophocythere*). Other forms, typified by *Lophocythere bradiana* (Jones), have an ornament consisting essentially of longitudinal ribs, usually 3 or 4 in number. The species of this second group lack the subvertical rib extending from the eye tubercle, and the details of ornament of the two valves often differs. Those species belonging to this group, the majority, are placed in the new subgenus, *Lophocythere* (*Neurocythere*).

#### Subgenus **LOPHOCY THERE** Sylvester-Bradley 1948

EMENDED DIAGNOSIS. Subgenus of *Lophocythere* characterised by strong ventro-lateral rib which antero-ventrally changes direction through 90 degrees to extend to eye tubercle. Valve surface reticulate, tuberculate or spinose.

TYPE SPECIES. *Cytheridea ostreata* Jones and Sherborn 1888.

DESCRIPTION. Carapace medium to large. Subrectangular, parallel-sided with little posterior convergence. Left valve larger than right with strong dorsal overlap. Anterior margin rounded, usually with prominent frill-like flange. Posterior margin pointed in the region of mid-height, right valves usually more sharply than left. Dorsal margin straight or slightly concave medianly, cardinal angles distinct. Ventral margin straight or medianly concave, usually overhung by the ventral rib. Greatest length at, or near mid-height, greatest height at the anterior cardinal angle, greatest width in the posterior third. Valve surface strongly ornamented. There is a ventral rib which usually reaches the anterior margin. Above this is a strong ventro-lateral rib extending across the valve from a postero-ventral to an antero-ventral position where it changes direction through 90 degrees, and extends dorsally to the eye tubercle. The ventro-lateral part of this rib may be discontinuous and spinose or tuberculate (*Lophocythere* (*L.*) *scabra bucki* Lutze). The remainder of the lateral surface may be strongly reticulate, bearing a number of short irregular thin ribs (*L.* (*L.*) *ostreata*) (Jones and Sherborn) or tuberculate and subspinose (*L.* (*L.*) *scabra bucki*). The marginal borders are smooth or feebly sculptured. Normal pore canals rather few, large and probably sieve-type. Marginal areas wide. Inner margin and line of concrescence coincide throughout. Selvage and flange generally well developed. Radial pore canals straight and well spaced; 6-8 anteriorly, 3-4 posteriorly. Hinge entomodont and robust. Muscle scars consist of a vertical, oblique or crescentic line of four adductors, with one oval anterior and a smaller antero-ventral scar. Sexual dimorphism strongly pronounced, the male valves being longer and proportionally less high than the females. Instars, particularly the earlier growth stages, are more convergent posteriorly and have more angular cardinal angles than the adults.

*Lophocythere (Lophocythere) scabra bucki* Lutze 1960

Plate 8. Figs. 15-24. Plate 9. Figs. 1, 5.

1960 *Lophocythere scabra bucki* n. subsp. Lutze : 430, pl. 37, figs. 1-2.1962 *Lophocythere scabra bucki* Lutze 1960. Brand and Fahrion : p. 148.

MATERIAL. 191, valves and carapaces.

DISTRIBUTION. Occuring in the *coronatum* zone of Staffin Bay ; and the *mariae* zone of Port-an-Righ and Staffin Bay. The species also occurs in England where it ranges from the *athleta* to the *cordatum* zone.DIMENSIONS. From sample OC-Call-CH-14, *athleta* zone, Crook Hill, brickpit, Dorset.

		Length	Height	Width
Male R.V.	10.5089	0.84	0.43	0.23
Male L.V.	10.5090	0.84	0.45	0.23
Male Carapace	10.5091	0.87	0.44	0.41
Female R.V.	10.5092	0.70	0.40	0.24
Female L.V.	10.5093	0.73	0.44	0.24
Female Carapace	10.5094	0.72	0.44	0.39

ONTOGENY. A large number of the later growth stages occur at certain horizons ; some dimensions from sample OC-Call-CH-15, *athleta* zone of Crook Hill brickpit, Dorset, are given below :

	Length		Height		L.H. ratio
	Range	Mean	Range	Mean	
Adult					
All female 10 R.V., 10 L.V.	0.76-0.79	0.77	0.43-0.49	0.45	1.70 : 1
Penultimate Instar					
10 R.V., 10 L.V.	0.61-0.65	0.63	0.36-0.41	0.38	1.67 : 1
Antepenultimate Instar					
10 R.V., 10 L.V.	0.56-0.61	0.60	0.32-0.37	0.34	1.75 : 1
Antepenultimate Instar minus one. 10 R.V., 10 L.V.	0.44-0.47	0.46	0.26-0.29	0.27	1.71 : 1
Antepenultimate Instar minus two. 2 L.V.	0.33-0.36	0.35	0.21-0.23	0.22	1.61 : 1

These readings are too few to place any great reliance of them statistically, but they do raise a number of points of interest. The increase in the length : height ratio is not regular and two of the growth stage give higher readings than that of the adult stage and also, the mean height increase (0.05) is greater than the mean length increase (0.03). Amongst all the other species of Jurassic ostracods studies by the author, and mean length increase has always been greater than the mean height increment.

REMARKS. The present material is slightly larger than the type material from the Middle Callovian of N.W. Germany (Lutze 1960 L : 0.62-0.80 ; H. 0.32-0.42). The subspecies has been recorded once before from Britain, from the *mariae* zone of

Oxfordshire (Lutze 1960). This subspecies differs from *L. (L.) scabra scabra* Triebel 1951 in possessing a row of spatulate tubercles ventro-laterally instead of a rib.

***Lophocythere (Lophocythere) interrupta interrupta* Triebel 1951**

Plate 9. Figs. 2-4, 6-10.

- 1949 Ostracod No. 886. Brand: 340, pl. 13, fauna 88, fig. 51.  
 1951 *Lophocythere interrupta* n. sp. Triebel: 96, pl. 47, figs. 35-41.  
 1960 *Lophocythere interrupta interrupta* Triebel 1951. Lutze: 431, pl. 36, fig. 6.  
 1962 *Lophocythere interrupta interrupta* Triebel 1951. Brand and Fahrion: 148, pl. 21, fig. 39.  
 1967 *Fastigatocythere interrupta interrupta* (Triebel 1951). Wienholz: 27, pl. 2, figs. 17-19.  
 1967 *Fastigatocythere interrupta directa* n. ssp. Wienholz: 28, pl. 2, figs. 20-22a; pl. 3, figs. 22b-23.

MATERIAL. 145 valves and carapaces.

DISTRIBUTION. Confined to the Callovian: occurring in the *coronatum* zone at Brora. Also occurring in the *coronatum*, *athleta* and *lamberti* zones of Dorset.

DIMENSIONS. Sample OC-Call-Ba-77, *coronatum* zone, Brora.

		Length	Height	Width
Female L.V.	HU.19.J.41	0.87	0.49	0.28
Female L.V.	Io.5095	0.88	0.48	0.28
Female R.V.	HU.19.J.43	0.88	0.45	0.27
Male R.V.	HU.19.J.44	0.99	0.44	0.25
Male R.V.	Io.5096	1.00	0.45	0.28
Male Carapace	Io.5097	1.00	0.44	0.51
Female Carapace	Io.5098	0.87	0.48	0.49

ONTOGENY. The adult and the 5 preceding growth stages occur; some dimensions from sample OC-Call-T.Pt.-25, the *lamberti* of zone Tidmoor Point, are given below.

	Length		Height		L : H
	Range	Mean	Range	Mean	
Adult (Females)					
8 R.V., 8 L.V.	0.81-0.85	0.81	0.41-0.47	0.44	1.86 : 1
Penultimate Instar					
8. R.V., 8 L.V.	0.62-0.69	0.65	0.33-0.37	0.35	1.84 : 1
Antepenultimate Instar					
8 R.V., 8 L.V.	0.48-0.52	0.50	0.27-0.30	0.28	1.80 : 1
Antepenultimate Instar minus one. 1 R.V., 4 L.V.	0.38-0.40	0.39	0.21-0.24	0.23	1.69 : 1
Antepenultimate Instar minus two. 4 L.V., 2 R.V.	0.31-0.32	0.31	0.18-0.20	0.17	0.64 : 1
Antepenultimate Instar minus three. 1 L.V.		0.26		0.17	0.56 : 1

Although there are insufficient measurements of the earlier growth stages to substantiate these results statistically, some interesting factors emerge. The length : height ratio exhibits a steady, but not regular increase from the earliest forms to the adult. Mean size increases are also irregular, as between the antepenultimate minus one and the antepenultimate stages and also between the penultimate and the adult.

REMARKS. The present author does not agree with the action of the late Dr. Weinholz (1967) in placing this species in her new genus *Fastigatocythere*. As *L. (L.) interrupta interrupta* possesses an eye spot it is clearly disqualified from membership of *Fastigatocythere*. The species *interrupta* is thought to have been derived from the *L. (L.) scabra* stock by the gradual suppression of the strongly tuberculate ornament of the latter. The material described herein is considerably variable in ornament and although forms similar to those described by Weinholz (1967) as *Fastigatocythere interrupta directa* n. ssp. do occur, it has not been possible to consistently differentiate such forms as a discrete subspecies. They are, in consequence, included within the subspecies *interrupta interrupta*.

The subspecies occurs in the *jason*, *coronatum* and *athleta* zones of Germany. This is the first record of the subspecies in Britain and its range is extended by one zone, into the *lamberti*.

#### Subgenus *NEUROCYTHERE* n. subgen.

TYPE SPECIES. *Cythere bradiana* Jones 1884.

DERIVATO NOMINIS. Greek. From the 'nerve' like nature of the ribs.

DIAGNOSIS. Subgenus of *Lophocythere* with usually 4 longitudinal ribs and reticulate intercostate areas. Ribs may or may not reach the anterior margin. Minor ribs lie between or connect the major ribs ; a small rib is associated with the eye tubercle.

REMARKS. The majority of the species of this genus belong to *Neurocythere* which is particularly important in the Bathonian, Callovian and in the lower and middle parts of the Oxfordian where it often dominates the ostracod fauna. Its abundance, wide lateral distribution and diversity of relatively short-lived species render it of considerable importance as a zonal indicator and for general purposes of correlation.

#### *Lophocythere (Neurocythere) cruciata alata* n. subsp.

Plate 9. Figs. 11-16. Plate 10. Figs. 1-5, 8.

DIAGNOSIS. Subspecies of *L. (N) cruciata* characterized by its strongly alate ventro-lateral rib, the discontinuous nature of the median rib and in having no ribs reaching the anterior margin.

HOLOTYPE. One left valve, HU.19.J.69, from sample OC-Call-SB-71, *lamberti* zone, Staffin Bay.



DERIVATO NOMINIS. Latin : from the alate nature of the ventro-lateral rib.

MATERIAL. 436 valves and carapaces.

DISTRIBUTION. Restricted to the *lamberti* zone of Staffin Bay, Skye.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
L.V.	HU.19.J.69	0.73	0.49	0.28
PARATYPES Same sample as holotype.				
L.V.	Io.5099	0.69	0.43	0.21
L.V.	Io.5100	0.73	0.49	0.27
R.V.	Io.5101	0.72	0.43	0.27
R.V.	Io.5102	0.75	0.43	0.28
R.V.	Io.5103	0.69	0.43	0.21
Carapace	Io.5104	0.71	0.44	0.39
Carapace	HU.19.J.76	0.68	0.41	0.40

DESCRIPTION. Medium to large. Subrectangular to subquadrate, inflated ventrally. Left valve larger than right with strong dorsal overlap. Anterior margin broadly rounded; posterior caudate with apex above mid-height, more dorsal and more pointed in right than in left valves. Dorsal margin straight, ventral margin medianly concave. Greatest length above mid-height; height and width in the posterior third of the valve. Surface ornament of longitudinal ribs with intercostal reticulations which are coarsest on the flanks of the ribs, particularly the ventral and ventro-lateral. The ventral rib extends in a shallow curve from the ventral part of the caudal process to an antero-ventral position. The ventro-lateral rib, which medianly becomes strongly alate, extends from a postero-ventral position to its antero-median junction with the anterior part of the median rib. The median rib is somewhat tenuous and is often interrupted medianly by a sulcus. The dorsal rib is variable. In the right valve it extends from a postero-dorsal position in an arc to its termination, just behind the eye spot. In the left valve it fringes the dorsal margin, passing dorsal to the eye spot, and is terminated on the anterior marginal border. A short rib extends from the eye spot to the junction of the median and ventro-lateral ribs. Three narrow ribs occur on the ventral surface. No ribs reach the anterior margin. Eye spot circular, glassy and prominent. Marginal areas wide, particularly anteriorly; inner margin and line of concrescence coincident throughout. Radial pore canals straight, well-spaced; 8 anteriorly and 2 posteriorly. Hinge entomodont, well developed. The terminal elements in the right valve are raised dentate ridges, each with 6 teeth. The median element is variable; in some forms it is a locellate groove, narrowing and shallowing but little posteriorly; in others the posterior part is a shallow locellate groove and in yet others the groove widens and deepens in the posterior 1/4 of its extent. Complementary structures occur in the left valve hinge, above which is a long, gutter-like accommodation groove. Muscle scars of 4 vertical adductors with a large anterior and a much smaller antero-ventral scar.

ONTOGENY. The adult and the three preceding growth stages are recorded.

Some dimensions from sample OC-Call-SB-70 are given below : In all stages except the youngest, (2 R.V., 2 L.V.) 10 R.V. and 10 L.V. are measured.

	Length		Height		L : H
	Range	Mean	Range	Mean	
Adult	0.65-0.71	0.66	0.30-0.45	0.38	1.77 : 1
Penultimate Instar	0.59-0.61	0.60	0.32-0.39	0.35	1.72 : 1
Antepenultimate Instar	0.52-0.55	0.53	0.31-0.32	0.31	1.71 : 1
Antepenultimate Instar minus one.	0.44-0.47	0.46	0.26-0.29	0.28	1.65 : 1

The adults of this species are very variable in size as can be seen from the above dimensions and from those of the paratypes. A gradual increase in the length : height ratio can be seen from the youngest form to the adult. Overlap may occur in the height of the various growth stages, but not in the length.

REMARKS. *L. (N.) cruciata alata* differs from all other subspecies of *cruciata* in the possession of a very strong alate ventro-lateral rib. Its origins are obscure and its true relationships difficult to assess, due to its isolation and restriction to the Hebrides. It appears to be most closely related to *L. (N.) cruciata intermedia* from which it could have been derived by the increasingly alate development of the ventro-lateral rib.

### *Lophocythere (Neurocythere) cruciata intermedia* Lutz 1960

Plate 10, Figs. 6, 7, 9-21. Plate 11, Figs. 1, 4.

1960 *Lophocythere cruciata intermedia* n. subsp. Lutz : 423, figs. 5-6.

MATERIAL. 288 valves and carapaces.

DISTRIBUTION. Occurring at all three localities in Scotland ; in the *coronatum* zone of Brora ; the *lamberti* and *mariae* zones of Staffin Bay ; and the *mariae* zone of Port-an-Righ. In England it occurs at a number of localities and ranges from the *athleta* to the *cordatum* zone.

DIMENSIONS. Sample OC-Call-T.Pt.-26, *lamberti* zone, Tidmoor Point, Dorset.

		Length	Height	Width
Female R.V.	Io.5106	0.59	0.35	0.17
Female L.V.	Io.5107	0.58	0.37	0.19
Male R.V.	Io.5108	0.64	0.35	0.19
Male R.V.	HU.19.J.80	0.61	0.35	0.19
Female Carapace	Io.5109	0.59	0.36	0.35
Male Carapace	Io.5110	0.64	0.36	0.34

ONTOGENY. The adult and the two preceding growth stages occur. 10 RV and 10 LV from each growth stage are measured, from sample OC-Call-CH-19, *athleta* zone, Crook Hill brickpit, Dorset.

	Length		Height		L : H
	Range	Mean	Range	Mean	
Adult	0.49-0.52	0.51	0.28-0.32	0.30	1.69 : 1
Penultimate Instar	0.43-0.45	0.44	0.23-0.25	0.24	1.81 : 1
Antepenultimate Instar	0.35-0.40	0.37	0.19-0.23	0.21	1.79 : 1

REMARKS. This subspecies has been recorded twice before from Britain, by Lutze (1960) from the *athleta* zone of Crook Hill, and from the *lamberti* zone of Woodham. The present records from the *mariae* and *cordatum* zones are an extension of the known range by two zones, and the first record from the Oxfordian. The subspecies is thought to be ancestral to *L. (N.) cruciata oxfordiana* Lutze, from which it is distinguished by its more quadrate outline, and in its possession of vertical ribs connecting the dorsal and median ribs. It differs from *L. (N.) cruciata alata* n. subsp. in lacking a strongly alate ventro-lateral rib.

### *Lophocythere (Neurocythere) cruciata oxfordiana* Lutze 1960

Plate II. Figs. 2, 3, 5-17.

- 1958 *Lophocythere cruciata cruciata* Triebel 1951. Bizon : 24, pl. 3, fig. 9.  
 1959 *Lophocythere cruciata cruciata* Triebel 1951. Oertli : 32-33, pl. 4, figs. 128-132.  
 1960 *Lophocythere cruciata oxfordiana* n. subsp. Lutze : 425-426, pl. 33, fig. 5.  
 1962 *Lophocythere cruciata oxfordiana* Lutze 1960. Brand and Fahrion : 147, pl. 21, fig. 43.  
 1962 *Lophocythere cruciata oxfordiana* Lutze 1960. Klingler, Malz and Martin : 184, pl. 25, fig. 2.  
 1963 *Lophocythere cruciata oxfordiana* Lutze 1960. Oertli, pl. XXXVII, 2.

MATERIAL. 1268 valves and carapaces.

DISTRIBUTION. This subspecies is widespread throughout the lower and middle part of the Oxfordian in Britain, ranging from the base of the *mariae* to the middle of the *cautisnigrae* zone. In Scotland it occurs in the *mariae* and *cordatum* zones at Staffin Bay ; and the *mariae* zone of Port-an-Righ.

DIMENSIONS. OC-Ox-Pn-25, *cordatum* zone Purton, Wilts.

		Length	Height	Width
Female R.V.	Io.5III	0.53	0.32	0.17
Female L.V.	Io.5II2	0.55	0.36	0.19
Male R.V.	Io.5II3	0.64	0.31	0.18
Male L.V.	HU.19.J.86	0.64	0.36	0.19
Female Carapace	Io.5II4	0.55	0.35	0.29
Male Carapace	Io.5II5	0.61	0.35	0.30

ONTOGENY. The adult and the four preceding growth stages are recognised. Dimensions from sample OC-Ox-Pn-25, *cordatum* zone, Purton, Wilts. are given below. For each stage except the earliest (3 R.V., 3 L.V.), 10 R. and 10 L. valves are measured. In the adult stage, half of the specimens belong to each sex.

	Range	Length		Height	
		Mean	Range	Mean	L : H
Adult	0.52-0.64	0.58	0.31-0.36	0.34	1.73 : 1
Penultimate Instar	0.48-0.41	0.50	0.27-0.29	0.28	1.76 : 1
Antepenultimate Instar	0.43-0.49	0.46	0.25-0.26	0.26	1.80 : 1
Antepenultimate Instar minus one.	0.37-0.41	0.39	0.21-0.24	0.23	1.73 : 1
Antepenultimate Instar minus two.	0.30-0.32	0.31	0.17-0.20	0.17	1.85 : 1

REMARKS. The subspecies varies greatly in size and shape both geographically and chronologically. Previous records have not mentioned sexual dimorphism which is, amongst the present material, pronounced at certain horizons, particularly in the *mariae* zone. The earlier forms are more quadrate than those occurring at higher levels and show a closer affinity to *L. (N.) cruciata intermedia* Lutze, from which *oxfordiana* is thought to have been derived. *L. (N.) oertlii* Bizon is similar, but in the latter, the 'cruciform' arrangement of the ribs is lost because the rib from the eye spot extends to the anterior margin instead of to the junction of the median and ventro-lateral ribs. Glashoff (1964) regards this subspecies as being synonymous with *L. (N.) oertlii* and discusses an '*oxfordians*' type of the latter species. Amongst the present material, however, the two species are quite distinctive and the present author cannot find any evidence to justify their being considered conspecific. Lutze (1960) describes this species as ranging down into the *lamberti* zone in N.W. Germany. The present material exhibits a somewhat greater range in length (0.53-0.64) than the type material (0.54-0.60).

### *Lophocythere (Neurocythere) cruciata cruciata* Triebel 1951

Plate II. Figs. 18-22.

- 1949 Ostracode No. 896. Brand : 338, pl. 13, fauna 7, fig. 5, pl. 14.  
 1951 *Lophocythere cruciata cruciata* n. subsp. Triebel : 99, 100, pl. 49, figs. 53-56.  
 1962 *Lophocythere cruciata cruciata* Triebel 1951. Brand and Fahrion : 146, pl. 21, fig. 29.  
 1967 *Lophocythere cruciata cruciata* Triebel 1951. Weinholz : pl. 5, figs. 62-63.  
 non 1958 *Lophocythere cruciata cruciata* Triebel 1951. Bizon : 24, pl. III, fig. 10.  
 non 1959 *Lophocythere cruciata cruciata* Triebel 1951. Oertli : 32, pl. 14, figs. 128-132.

MATERIAL. 9 valves and carapaces.

DISTRIBUTION. Occuring in Britain only in the *coronatum* zone of Brora.

DIMENSIONS. Sample OC-Call-Ba-77, *coronatum* zone, Brora.

		Length	Height	Width
Female L.V.	Io.5116	0.73	0.44	0.27
Female Carapace	Io.5117	0.79	0.47	0.43

REMARKS. This is the first record of the subspecies from Britain. The ribs of the present specimens are less well developed than the type material and the reticulations proportionally stronger.

*Lophocythere (Neurocythere) flexicosta lutzei* n. subsp.

Plate 12. Figs. 1-12.

- 1960 *Lophocythere flexicosta* n. subsp. A. Lutze : 428-429, pl. 36, figs. 2-3.  
 1962 *Lophocythere flexicosta* subsp. A. Lutze 1960. Brand and Fehrlion : 149, pl. 21, fig. 41.  
 1963 *Lophocythere flexicosta* subsp. A. Lutze 1960. Oertli, pl. XXXIV, 1, 2, XXXV, 1.  
 1967 *Lophocythere flexicosta* ssp. A. Lutze 1960. Wienholz : pl. 5, fig. 57.

DIAGNOSIS. A strongly dimorphic subspecies of *flexicosta*, characterized by its rectangular outline and smooth, thick ribs. The dorsal and median ribs are always united posteriorly, the reticulations on the flanks of the ribs are very coarse.

HOLOTYPE. One female right valve, HU.19.J.102. From sample OC-Call-Wm-24, *athleta* zone Woodham brickpit.

DERIVATO NOMINIS. In honour of Dr. G. F. Lutze who first recognized the subspecies, in recognition of his valuable contributions to our understanding and appreciation of Jurassic microfossils.

MATERIAL. 300 valves and carapaces.

DISTRIBUTION. In Scotland occurring only in the *coronatum* zone at Brora. In England it ranges from the *athleta* to the *lamberti* zone.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Female R.V.	HU.19.J.102	0.63	0.36	0.16
PARATYPES Same sample as holotype.				
Female R.V.	Io.5118	0.73	0.40	0.19
Male R.V.	Io.5119	0.87	0.40	0.17
Male L.V.	Io.5120	0.89	0.44	0.17
Male Carapace	Io.5121	0.89	0.43	0.36
Female Carapace	Io.5122	0.71	0.43	0.33

DESCRIPTION. Medium to large. Thick shelled. Subrectangular, strongly dimorphic. Left valve larger than right with conspicuous dorsal overlap. Anterior margin rounded ; posterior bluntly pointed. Dorsal margin straight ; ventral with slight median concavity ; both margins largely obscured in lateral view by the overhang of the dorsal and ventral ribs respectively. Greatest length at mid-height ; height, at the anterior cardinal angle ; width, medianly. Sculpture of broad smooth ribs and intercostate reticulations which are particularly coarse on the flanks of the ribs. A complex of ramifying and anastomosing ribs occurs antero-medianly. The ventral rib extends in a shallow curve from the ventral part of the posterior margin to this complex. The ventro-lateral rib which extends from a mid-posterior position, and the median rib which extends from a postero-dorsal position, both lose their identity in the antero-median complex. The dorsal rib, which is united posteriorly to the median rib, extends in an arc across the dorso-lateral surface to this complex and a short rib extends ventrally from the eye spot also to this complex. A number

of narrow ribs occur on the ventral surface and may extend on to the antero-marginal border. The eye spot is large and prominent. The valve surface slopes steeply from the anterior margin to the lateral surface. Marginal areas wide; line of concrescence and inner margin coincide throughout. Selvage well developed, and a frill-like flange occurs both anteriorly and posteriorly. Radial pore canals straight and well-spaced; 6-8 anteriorly, 2-4 posteriorly. Hinge entomodont and very strongly developed, with proportionally long terminal elements. In the right valve, the anterior terminal element is an elongate dentate ridge with 5 oval, sometimes bifid teeth. The posterior terminal element has 7 teeth, which apart from the posterior two, decrease in size and height proximally. The median element comprises a deep loculate groove with 5 locules anteriorly and a shorter locellate groove posteriorly. The median element is bounded ventrally by a strong ridge, which expands distally to form the terminal elements. Complementary structures occur in the left valve hinge, above which is a narrow, shelf-like accommodation groove. Muscle scars consist of four vertically disposed adductors with a large anterior and a much smaller antero-ventral scar. Sexual dimorphism strongly pronounced, the male valves being longer and proportionally less high than the females.

ONTOGENY. The adult and the three preceding growth stages occur. Dimensions from sample OC-Call-CH-14, *athleta* zone, Crook Hill, are given below. In this population, all the adults are females. 10 R.V. and 10 L.V. are measured for each stage.

	Length		Height		L : H
	Range	Mean	Range	Mean	
Adult	0.69-0.73	0.71	0.38-0.43	0.40	1.73 : 1
Penultimate Instar	0.56-0.58	0.57	0.29-0.33	0.32	1.80 : 1
Antepenultimate Instar	0.42-0.45	0.44	0.24-0.26	0.25	1.82 : 1
Antepenultimate Instar minus one.	0.33-0.35	0.34	0.20-0.21	0.20	1.09 : 1

The length : height ratio shows a sharp increase from the earliest growth stage to the antepenultimate, followed by a slight decrease to the adult. Although the earlier forms have merodont hinging and weak ribs, the penultimate instar has the same hinge and sculpture as the adult.

REMARKS. This subspecies has been previously recorded from Britain as *L. flexicosta* n. subsp. A. from the *athleta* zone of Woodham brickpit by Lutze 1960. This subspecies differs from *L. (N.) flexicosta flexicosta* Triebel in its larger size and more rectangular shape and in its stronger and smoother ribs.

The present material is somewhat larger than that described from N.W. Germany, (Lutze 1960).

	Length	Height
N.W. Germany	0.67-0.85	0.37-0.44
Britain	0.68-0.89	0.36-0.46

Genus *FUHRBERGIELLA* Brand and Malz 1962Subgenus *PRAEFUHRBERGIELLA* Brand and Malz 1962

REMARKS. This subgenus differs on grounds of ornament from its closest allies. *Glyptocythere*, *Progonocythere*, *Lophocythere* s.l. It may be ancestral to *Lophocythere*. The species *F. (P.) horrida* Brand and Malz, described below, has not previously been recorded from above the Bajocian, and this present record is an extension of the known range of the genus up into the lower Oxfordian.

*Fuhrbergiella (Praefuhrbergiella) horrida horrida* Brand and Malz 1962

Plate 12. Figs. 13–15., Plate 13. Figs. 1–5.

- 1960 Ostracode No. 10. Lutze : 435, pl. 38, fig. 5.  
 1962 *Fuhrbergiella (Praefuhrbergiella) horrida horrida* n. subsp. Brand and Malz : 19–21, pl. 4, figs. 33–37, pl. 5, fig. 46.  
 1962 *Fuhrbergiella (Praefuhrbergiella) horrida horrida* Brand and Malz 1962. Brand and Fahrion : 141, pl. 20, fig. 52.

MATERIAL. 41, valves and carapaces.

DISTRIBUTION. In Scotland occurring in the *mariae* zone at Port-an-Righ and ranging from the *lamberti* to the *cordatum* zone at Staffin Bay. Also recorded from the *koenigi* and *cordatum* zones in England.

DIMENSIONS. Sample Kell-Pl-2 Kellaways Clay, Putton Lane brickpit, Nr. Weymouth, Dorset. *koenigi* zone.

		Length	Height	Width
Female Carapace	Io.5I23	0.62	0.35	0.19
Sample OC-Ox-Pn-31, <i>cordatum</i> zone, Purton, Wilts.				
Male R.V.	Io.5I24	0.68	0.36	0.33

ONTOGENY. The adult and the 4 preceding growth stages occur. Some dimensions from sample OC-Ox-Pn-31, *cordatum* zone Purton, Wilts, are given below:

	Length	Height
Adult R.V.	0.67	0.36
Penultimate Instar L.V.	0.56	0.35
Antepenultimate Instar L.V.	0.41	0.27
Antepenultimate Instar minus one L.V.	0.35	0.21
Antepenultimate Instar minus two L.V.	0.27	0.19

REMARKS. This species is extremely variable with the surface ornament either coarsely reticulate or irregularly spinose. A similar variation is to be seen in the illustrations of the type material.

Family *PROTOCYTHERIDAE* Lyubimova 1955

REMARKS. In the American Treatise (1961, Q327) the subfamily Protocytherinae Lyubimova 1955, is considered as a subfamily of the Progonocytheridae Sylvester-

Bradley 1948. Bate (1963a, p. 209) removed this subfamily from the Progonocytheridae and elevated it to the status of family. The present author would also include here the Pleurocytherinae Mandelstam 1960, rather than retain it in the Progonocytheridae as done by Bate (1963).

Subfamily **PLEUROCYTHERINAE** Mandelstam 1960

Genus **PALAEOCYTHERIDEA** Mandelstam 1947

REMARKS. This genus was erected by Mandelstam with *Palaeocytheridea bakirovi* Mandelstam as type species. Contrary to the rules of the I.C.Z.N., Lyubimova (1955) and later Mandelstam (1960) decided that *P. bakirovi* was not a typical member of the genus and designated a different type species. This second type, *Eucythere denticulata* Sharapova 1937, is very different from *P. bakirovi* and cannot be included within the genus *Palaeocytheridea* as originally defined. Therefore, the genus *Palaeocytheridea* sensu Lyubimova 1955 and Mandelstam 1960 is invalid and must be suppressed. *Palaeocytheridea* (sensu Mandelstam 1947) is placed here tentatively in the Pleurocytherinae because of its close similarity to *Pleurocythere*.

***Palaeocytheridea parabakirovi*** Malz 1962

Plate 13. Figs. 6-9.

1962 *Palaeocytheridea parabakirovi* n. sp. Malz : 236-239, pl. 24, figs. 2-4.

1967 *Palaeocytheridea parabakirovi* Malz, 1962. Wienholz : pl. 5, figs. 65-66.

MATERIAL. 18 valves and carapaces, mostly fragmentary.

DISTRIBUTION. Occurring in the *coronatum* zone at Brora, and the *macrocephalus* zone of Dorset.

DIMENSIONS. Sample OC-Call-Ba-87, *coronatum* zone Brora.

	Length	Height	Width
Carapace	10.5125	0.60	0.35
			0.28

REMARKS. The present material is very similar in size to the type, from the *jason* zone of N.W. Germany. This species differs from *P. bakirovi* Mandelstam in possessing a dorsal rib extending ventrally from the anterior cardinal angle and in lacking a rib between the median and ventro-lateral ribs. This is the first record of the species in Britain.

Genus **PLEUROCYTHERE** Triebel 1951

REMARKS. *Pleurocythere* is very similar to *Protocythere* Triebel, particularly with regard to the nature of the radial pore canals and hingement. *Protocythere* has only 3 ribs, which are usually much more swollen than those of *Pleurocythere*, and also has a very marked anterior hinge ear in the left valve. *Pleurocythere* would appear to be ancestral to *Protocythere*, and the species of the former here described show much



closer affinities to such Jurassic species of *Protocythere* as *P. sigmoidea* Steghaus and *P. rodewaldensis* (Klingler), than to the better known Lower Cretaceous forms. The species of *Pleurocythere* here described are the first recorded from the British Callovian and Oxfordian, where they form a not unimportant element of the ostracod fauna. A striking, but superficial similarity to some of the contemporary species of *Lophocythere* (*Neurocythere*) is observed. In N.W. Germany, of the large fauna of *Pleurocythere* species described by Triebel (1951), none extended above the Bathonian. The present record of the genus extending up into the *cordatum* zone in Britain, is a considerable extension of the known range of the genus. *Protocythere quadricarinata* Swain and Peterson 1952, from the equivalent of the *mariae* zone of North America, is probably better accommodated in *Pleurocythere*. The present author does not accept Wienholz' (1967) subdivision of the genus into *Pleurocythere* s.s. and the new subgenus *Sabacythere*. The reasons given for these subdivisions are not more than is consistent with variation within a genus.

***Pleurocythere borealis borealis* sp. nov. subsp. nov.**

Plate 13, Figs. 10-24.

DIAGNOSIS. Elongate *Pleurocythere* with well rounded anterior and bluntly pointed posterior margins. Sculpture of very weak longitudinal ribs and smooth or minutely punctate intercostate areas.

HOLOTYPE. One male right valve, HU.20.J.22 sample OC-Ox-SB-77, *mariae* zone Staffin Bay.

DERIVATO NOMINIS. From its apparent restriction to the Jurassic of N.W. Scotland.

MATERIAL. 23 valves and carapaces.

DISTRIBUTION. Occurring in a single sample from the *mariae* zone of Staffin Bay, Skye.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Male R.V.	HU.20.J.22	0.68	0.33	0.16
PARATYPES				
Male R.V.	Io.5126	0.72	0.33	0.17
Female R.V.	Io.5127	0.64	0.33	0.17
Male L.V.	Io.5128	0.70	0.37	0.17
Female L.V.	Io.5129	0.68	0.37	0.17
Female Carapace	Io.5130	0.68	0.40	0.31

DESCRIPTION. Medium to large, subrectangular, elongate, Dimorphic, males longer and less high than females. Left valve larger than right with considerable dorsal overlap. Anterior margin asymmetrically rounded with extremity below mid-height. Posterior margin bluntly pointed, apex at mid-height. Dorsal and ventral margins with slight median concavities. Greatest length below mid-height ;

height, at the anterior cardinal angle; width, postero-ventrally. Sculpture of longitudinal ribs, with smooth or minutely punctate intercostate areas. There are three major ribs. The ventro-lateral rib extends from a postero-ventral position to its tenuous junction with the median rib antero-medially. The median rib extends diagonally across the valve from a postero-median position to this junction. The dorsal rib is very weak, particularly in the left valve. The inverted 'Y'-shaped rib associated with the eye tubercle, which is characteristic of the genus, is poorly developed. Small longitudinal, vertical and oblique ribs occur between the major ribs. One or more small tubercles occur posteriorly. Eye spot weakly developed. Normal pore canals few and scattered. Marginal areas wide antero-ventrally, of medium width elsewhere. Inner margin and line of concrescence coincident throughout. Selvage strong ventrally. Radial pore canals long and thin, slightly sinuous and slightly thickened at their extreme distal extent; 9 anteriorly, concentrated antero-ventrally with the most dorsal slightly upturned; 5 posteriorly, the most dorsal two being vertically inclined. A variable number of false canals occur anteriorly. Hinge antimerodont. In the right valve, the terminal elements are raised dentate ridges each with 6 teeth, which are weakly incised dorsally. The median element is a long locellate groove, open ventrally and bounded dorsally, by a smooth bar. Complementary structures occur in the left valve hinge, where the terminal elements are open ventrally and distally. Accommodation groove shallow and gutter-like.

REMARKS. This subspecies differs from *Pleurocythere borealis carinata* n. subsp. in its more rounded cardinal angles and less well developed major ribs. From the type species, *P. richteri* Triebel 1951, it differs in possessing weaker and much thinner ribs, although the outline of the two is very similar. *Pleurocythere (Sabacythere) arcuata* Wienholz (1967) is very similar but considerably shorter with a range in length of 0.59–0.62 for females and 0.63–0.66 for males, compared with 0.64–0.68 for females and 0.68–0.72 for males in the present material. As the two subspecies of *P. borealis* described herein are recorded from the *mariae* and *cordatum* zones of the Oxfordian, it seems almost certain that *P. arcuata* from the *lamberti* zone of Germany, is an ancestral form.

***Pleurocythere borealis carinata* n. subsp.**

Plate 14. Figs. 1–12, 14.

DIAGNOSIS. Subspecies of *Pleurocythere borealis* with thin but well defined longitudinal ribs. A prominent rib lies between the median and ventro-lateral ribs.

HOLOTYPE. One female left valve, HU.20.J.28, sample OC–Ox–SB–83, *mariae* zone Staffin Bay, Skye.

DERIVATO NOMINIS. Because of the relatively strong ribbing developed in this subspecies.

MATERIAL. 18, valves and carapaces.

DISTRIBUTION. From the *coronatum* zone at Brora, and the *mariae* zone at Staffin Bay.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Female L.V.	HU.20.J.28	0.61	0.37	0.17
PARATYPES Same sample as Holotype.				
Male L.V.	Io.5131	0.63	0.31	0.15
Male R.V.	Io.5132	0.64	0.33	0.16
Female Carapace	Io.5133	0.63	0.38	0.32

DESCRIPTION. Medium ; subrectangular. Dimorphic ; males slightly longer and less high than females. Left valve larger than right with dorsal overlap. Anterior margin well-rounded in left valve, rather more angular in right ; extremity below mid-height. Posterior margin more pointed in right than left valve ; apex at mid-height. Dorsal margin straight, overhung in right valve by dorsal rib. Ventral margin with slight median concavity, medianly obscured by valve tumidity. These margins converge posteriorly, particularly in right valves. Greatest height at the anterior cardinal angle ; width, postero-ventrally. Sculpture of longitudinal ribs with smooth or finely punctate intercostate areas. There are three major ribs. The ventro-lateral rib extends across the valve to its antero-median junction with the median rib, the latter extending to this junction from a postero-median position. In the right valve the median rib is continuous, in the left it is interrupted medially. The dorsal rib extends from a postero-dorsal position, in an arc across the dorsal-lateral surface to its termination posterior to the eye tubercule. This rib is most strongly developed in the right valve where it overhangs the dorsal margin. A short rib occupies the posterior part of the area between the ventro-lateral and the median ribs, and another in the form of an inverted ' Y ', extends vertically from the eye spot. A number of weak ribs occur on the ventral surface. A short rib may connect the ventro-lateral and median ribs anteriorly. Eye tubercule small. Normal pores most numerous ventrally. Marginal areas widest anteriorly. Inner margin and line of concrescence coincide throughout. Nine radial pore canals, with slight distal thickenings occur anteriorly together with 3 false canals. These canals are concentrated antero-ventrally and the most dorsal are upturned. 5 canals occur posteriorly, of which the two most dorsal are vertically inclined. Hinge anti-merodont and strongly developed. The terminal elements in the right valve are strong elongate dentate ridges with 6 teeth anteriorly and 7 posteriorly. These teeth are secondarily incised dorsally and increase in height distally. The median element is a locellate groove, ventrally closed at its extremities but open medially. The distal ventral wall of this groove are expanded distally to form the terminal elements. Complementary structures occur in the left valve hinge, where the loculate terminal elements are open distally. The accommodation groove is wide and shelf-like. There are four vertically aligned adductors and a single heart-shaped anterior scar.

REMARKS. The differences between this subspecies and *P. borealis borealis* n.

subsp. are outlined in the 'Remarks' of the latter. From *P. richteri* Triebel *P. borealis carinata*, differs in its thinner ribs, in possessing a rib between the median and ventro-lateral ribs, and in its more angular anterior cardinal angle.

*Pleurocythere caledonia* n. sp.

Plate 14. Figs. 13, 15-24. Plate 15. Figs. 1-4, 11.

DIAGNOSIS. A new species of the genus *Pleurocythere* characterised by its strongly asymmetrical anterior margin and antero-ventral marginal spines.

HOLOTYPE. One female left valve HU.20.J.32, sample OC-Call-SB-71, *lamberti* zone, Staffin Bay, Skye.

DERIVATO NOMINIS. From its apparent restriction to the Jurassic of Scotland.

MATERIAL. 155 valves and carapaces.

DISTRIBUTION. Ranging from the *lamberti* to the *cordatum* zone at Staffin Bay, and from the *mariae* to the *cordatum* zone at Port-an-Righ.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Female L.V.	HU.20.J.32	0.68	0.39	0.18
PARATYPES	From the same sample as the Holotype.			
Female L.V.	Io.5134	0.69	0.40	0.19
Male L.V.	Io.5135	0.69	0.36	0.18
Male L.V.	Io.5136	0.69	0.36	0.19
Male R.V.	Io.5137	0.71	0.36	0.21
Female R.V.	Io.5138	0.64	0.35	0.22
Female Carapace	Io.5139	0.68	0.40	0.33

DESCRIPTION. Medium ; subrectangular, elongate. Dimorphic ; males slightly longer and proportionally less high than the females, the latter also being less convergent posteriorly. Left valve larger than right with considerable dorsal overlap. Anterior margin subangular with ventral extremity accentuated by a variable number (up to 18) of antero-ventral marginal spines which are usually upturned. Posterior margin caudate, with apex at or near mid-height and more pointed in male than female valves. Marginal denticles may also occur postero-ventrally. Dorsal margin straight or medianly concave ; a poorly developed hinge-ear is present anteriorly in the left valve. Ventral margin medianly concave. These margins converge more strongly in right than in left valves. Greatest height at the anterior cardinal angle,  $\frac{1}{5}$ th of the distance from the anterior margin ; greatest width postero-ventrally. Surface sculpture of longitudinal ribs, small circular tubercles and intercostate reticulations which are strongest on the flanks of the ribs. The ribs are usually more strongly developed in the right than in the left valve. On the ventral and ventro-lateral surfaces, some 6 or 7 small ribs occur. Some of these ribs extend from a postero-ventral to a ventro-median position ; others from a ventro-median to an antero-median position. None extend the entire length of the valve.

One of these ribs is upturned anteriorly to join the median rib. There is a small circular tubercle immediately anterior to this junction. The median rib extends from a posterodorsal to an antero-median position and may be broken medianly. In right valves, the dorsal rib extends from its postero-dorsal junction with the median rib, in an arc across the dorsal surface of the valve to its termination posterior to the posterior branch of the eye tubercle rib. It overhangs the dorsal margin and is often interrupted mid-dorsally. In the left valve, the rib is much weaker and does not overhang the margin. A short, but prominent eye tubercle rib extends in the form of an inverted 'Y' ventrally from the anterior cardinal angle; another lies between the median and ventro-lateral ribs and a further short rib connects the median and ventro-lateral ribs anteriorly. Several smooth circular tubercles occur posteriorly; one at the posterior cardinal angle, one at the junction of the dorsal and median ribs, and one or two postero-ventrally. Eye spot largely obscured by its associated rib. Marginal areas wide anteriorly. Inner margin and line of concrescence coincide throughout. Selvage strongly developed ventrally. Radial pore canals thin, slightly sinuous and thickened distally; 8-10 anteriorly with some false canals; 4-6 posteriorly, the most dorsal of which is vertically inclined. Hinge antimerodont. In the right valve, the terminal elements are long dentate ridges with 5-6 smooth teeth anteriorly and 6-7 rather larger teeth posteriorly. All these teeth exhibit a faint secondary dorsal crenulation. The median element is a long locellate groove, open ventrally. The left valve hinge contains complementary structures and the terminal loculate sockets are open ventrally and distally. The accommodation groove is shelf-like with a central shallow, gutter-like groove. Muscle scars consist of a crescentic line of 4 adductors with a single heart-shaped anterior scar.

REMARKS. This species differs from all other known species of *Pleurocythere* in the shape and spinose nature of the anterior margin. It is probably most closely related to such Bathonian species as *P. connexa* and *P. favosa* Triebel 1951, but differs in significant details of shape and ornament. Some variation is apparent throughout the observed range of the species; for example, the *lamberti* zone forms are rather more elongate and have stronger marginal denticulations than do those from higher horizons.

Subfamily **KIRTONELLINAE** Bate 1963

Genus **PSEUDOHUTSONIA** Wienholz 1967

REMARKS. The present author would place this genus, together with *Hutsonia* and *Loonyella*, in the *Kirtonellinae* Bate, on grounds of shape, ornament, hingement and musculature. *Balowella*, Wienholz (1967) is in the present author's opinion, congeneric with *Pseudohutsonia*.

***Pseudohutsonia hebridica*** n. sp.

Plate 15. Figs. 5-10, 12-14, 16, 18.

DIAGNOSIS. Species of *Pseudohutsonia* characterised by a strong ventro-lateral rib; a series of narrow ribs radiating from the dorsal margin and a small but prominent median tubercle.

HOLOTYPE. One female L.V. HU.20.J.66, sample OC-Ox-SB-77, *mariae* zone, Staffin Bay, Skye.

DERIVATO NOMINIS. From its apparent restriction to the Jurassic of the Hebrides.

DISTRIBUTION. Occurring only at Staffin Bay, and ranging from the *lamberti* to the *cordatum* zone.

MATERIAL. 137 valves and carapaces.

DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Female L.V.	HU.20.J.66	0.53	0.32	0.17
PARATYPES	From the same sample as the holotype.			
Female L.V.	Io.5140	0.53	0.32	0.17
Female R.V.	Io.5141	0.53	0.30	0.15
Female R.V.	Io.5142	0.56	0.30	0.16
Female Carapace	Io.5143	0.53	0.33	0.27

DESCRIPTION. Medium, subrectangular to sub-ovate. Dimorphic; two broken but distinctly more elongate valves occurring and presumed to be males. Anterior margin rounded, extremity at, or below mid-height; posterior margin caudate with apex above mid-height. Dorsal margin straight in right valve; medianly concave in left, with weak anterior hinge ear. Ventral margin upturned posteriorly, largely obscured in lateral view by valve tumidity. Greatest height in anterior third; width, ventro-medially. Left valve larger than right with dorsal overlap; left valve also deeper than right. The main feature of the surface sculpture is a strong smooth rib extending ventrally from the anterior cardinal angle and then curving posteriorly to extend in an arc across the ventro-lateral surface. Radiating from the dorsal margin, and extending towards this rib, are a series of 4 or 5 narrow ribs. A slight median sulcus occurs, anterior to which is a well defined tubercle. The anterior and posterior marginal borders are smooth. Three to 5 thin ribs lie between the main rib and the ventral margin. Intercostate areas are smooth. Eye spot absent. Normal pore canals moderately numerous, concentrated ventrally. Marginal areas rather narrow; widest postero-ventrally. A slight anterior vestibule may occur; inner margin and line of concrescence usually coincident throughout. Radial pore canals short and straight; 8 anteriorly, 3 posteriorly. A thin frill-like flange occurs anteriorly. Hinge antimerodont. In the right valve the terminal elements are rather low dentate ridges with 5 teeth anteriorly and 7 posteriorly. The median element is a locellate groove which is ventrally closed distally and bounded dorsally by a smooth bar. The distal ventral bounding ridge of the median element is expanded distally to form the terminal elements. Complementary structures occur in the left valve hinge, above which is a gutter-like accommodation groove. Muscle scars consist of a vertical line of 4 adductors and two widely spaced anterior scars of which the dorsal is the larger.

REMARKS. This species would appear to be most closely allied to *Protocythere attendens* Lyubimova 1955, which is best accommodated in *Pseudohutsonia* but differs

in possessing a more prominent sculpture of thinner and better defined ribs. From *P. tuberosa* Wienholz it differs in lacking broad swellings dorso-laterally. Very little variation occurs throughout the range of the species although the younger members are somewhat thicker shelled and have more subdued sculpture than the earlier forms.

*Pseudohutsonia* sp. A.

Plate 15. Figs. 15, 20, 21.

1958 *Hutsonia* (?) sp. Bizon : 29, pl. 3, figs. 12-14, pl. 4, figs. 17-18.

1964 *Hutsonia* sp. Glashoff : 46, not figured.

MATERIAL. One male L.V., one female carapace.

DISTRIBUTION. From the *cordatum* zone of Port-an-Righ, and Furzy Cliff, near Weymouth, Dorset.

DIMENSIONS. From sample OC-Ox-PaR-52.

		Length	Height
Male L.V.	Io.5144	0.52	0.27

DESCRIPTION. Small to medium. Dimorphic. Anterior margin rounded ; posterior pointed with apex above mid-height. Left valve larger than right with dorsal overlap. Dorsal margin long and straight, or with slight median concavity ; ventral margin strongly upturned posteriorly. Sculpture of broad ribs and swellings. A broad rib extends ventrally from the anterior cardinal angle to an antero-ventral position, where it expands and increases in height. Dorsal to this is a vertically inclined median sulcus separating two large swellings. The intervening areas are punctate, weakly reticulate, or covered with very small ribs, especially on the caudal process where they are vertically aligned. Internal features typical of the genus.

REMARKS. This species, which is left here with open nomenclature because of insufficiency of material, is evidently very rare, two earlier records are from the *mariae* zone of Villers-sur-Mer (Bizon 1959) and of Warboys, Huntingdonshire (Glashoff 1964).

Genus *PSEUDOPERISSOCYTHERIDEA* Mandelstam 1960

REMARKS. This genus has been discussed by Brand & Malz (1962, pp. 25), and included in it by them, apart from the type (*Protocythere crassula* Mandelstam 1947) are three American species, *Progonocythere hieroglyphica* and *P. crowcreekensis* Swain & Peterson 1951 and *P. anoda* Peterson 1954, all from the Callovian and Oxfordian of the N. and N.W. United States. They also place here *Palaeocytheridea nikitina* and *P. milanovki* Lyubimova 1955, from the Lower Callovian of Russia. The present writer would prefer to consider *Progonocythere crowcreekensis* Swain & Peterson, as a species of *Fuhrbergiella*, to which its roughly reticulate ornament and sub-central tubercle would tend to ally it, rather than to the genus under consideration here. *Pseudoperissocytheridea parahieroglyphica* n. sp., described below has a surface sculpture mid-way between the costate American and the reticulate Russian forms.

*Pseudoperissocytheridea parahieroglyphica* n. sp.

Plate 15. Figs. 17, 19, 22-33.

DIAGNOSIS. Species of *Pseudoperissocytheridea* with surface sculpture consisting of a series of 'U' shaped ribs which enclose a median area of more irregular ribs.

HOLOTYPE. One female L.V., HU.20.J.13, sample OC-Ox-Fy-5, *cordatum* zone, Furzy Cliff, Nr. Weymouth, Dorset.

DERIVATO NOMINIS. From its similarity to *P. hieroglyphica* (Swain & Peterson 1951).

DISTRIBUTION. In Scotland occurring in the *mariae* and *cordatum* zones at Port-an-Righ, and in the *cordatum* zone at Staffin Bay. It also occurs at a number of localities in the south of England where it ranges from the *mariae* to the *plicatilis* zone.

## DIMENSIONS.

		Length	Height	Width
HOLOTYPE				
Female L.V.	HU.20.J.13	0.47	0.25	0.13
PARATYPES	From the same sample as the holotype.			
Female L.V.	Io.5145	0.45	0.24	0.15
Female R.V.	Io.5146	0.48	0.25	0.13
Male L.V.	Io.5147	0.55	0.27	0.15
Male R.V.	Io.5148	0.52	0.23	0.15
Female Carapace	Io.5149	0.55	0.25	0.27

DESCRIPTION. Medium. Subrectangular, thin-shelled. Left valve larger than right with dorsal and ventral overlap. Anterior margin of right valve rounded, with angle above mid-height and extremity at, or near mid-height; left valve more angular. Anterior cardinal angle more pronounced in left than in right valves. Posterior margin pointed with apex above mid-height. Postero-ventral slope convex in both valves; postero-dorsal slope concave in right and straight or convex in left. Ventral margin straight, upturned posteriorly. These margins converge more strongly posteriorly in right than in left valves, greatest height at the anterior cardinal angle; width, in the posterior third. Sculpture consists of an irregular pattern of small thin ridges. Medially these ridges produce a coarsely reticulate pattern. Posteriorly, a group of 3-5 of these ridges extend vertically from the posterior cardinal angle to a postero-ventral position where they change direction through 90° and extend along the ventro-lateral surface to an antero-ventral position where they coalesce. They then change direction again through 90° and extend dorsally towards the anterior cardinal angle. Both anteriorly and posteriorly, these ribs form the junction between the highly ornamented lateral surface and the smooth marginal borders. A ridge borders the anterior margin and extends to a mid-ventral position. The extremity of the anterior margin is formed by a frill-like flange. A small ridge extends across the caudal process. Eye spot small and very close to the anterior cardinal angle. Normal pore canals few, large and circular. Marginal areas rather wide. The inner margin and line of concrescence usually coincide



throughout, but may diverge slightly anteriorly and or postero-ventrally. Radial pore canals straight, evenly spaced ; 8 anteriorly and 4 posteriorly. Hinge anti-merodont. In the right valve, the terminal elements are raised dentate ridges with 5 teeth anteriorly and 7 posteriorly ; in both cases the teeth increase in size and height distally. The median element is a locellate groove. Complementary structures occur in the left valve hinge above which is a shelf-like accommodation groove. There are 4, vertically aligned adductors, anterior scars not seen. Sexual dimorphism pronounced ; male valves more elongate than female.

REMARKS. This species most closely resembles *P. hieroglyphica* (Swain & Peterson 1951) from the Redwater Shale member of the Morrison Formation of S. Dakota ; this falls within the *Cardioceras* (*Scarburgiceras*) *codiforme* zone which, according to Imlay, (1947, p. 261) is equivalent to the *mariae* zone of N.W. Europe. The present species differs from *Pseudoperissocytheridea hieroglyphica* in its less well defined ornament. The series of ribs which surround the median area on three sides are better developed in *P. hieroglyphica* and the ribs of the median area are stronger and more vertical in aspect. The present species is also smaller. From the two Russian species, *P. nitikina* and *P. milanovski* (Lyubimova 1955), *P. parahieroglyphica* n. sp. differs in possessing costate rather than reticulate ornament dorso-medianly.

## IV. REFERENCES

- ANDERSON, F. W. 1961. In British Regional Geology, Scotland : The Tertiary Volcanic Districts. *Brit. reg. Geol.*, London : 1-120.
- 1964. Rhaetic Ostracoda. *Bull. geol. Surv. Gt. Br.*, London, **21** : 133-174, pls. 8-15.
- 1966. In ANDERSON, F. W. & DUNHAM, K. C. 1966. The Geology of Northern Skye. *Mem. geol. surv. Scotland*, Edinburgh : 1-216.
- APOSTOLESCU, V. & BOURDON, M. 1955. In Correlations dans le Lias marneux des Causses majeurs. *Rev. Inst. franç. Pétrole*, Paris, **11** : 439-449, tables 1-4.
- ARKELL, W. J. 1933. *The Jurassic System in Great Britain*. viii + 681 pp., 41 pls. Oxford.
- ARKELL, W. J. 1956. *Jurassic Geology of the World*. xv + 806 pp., 46 pls. Edinburgh.
- BAIRD, W. 1845. Arrangement of the British Entomostraca. *Hist. Berwicksh. Nat. Club*, **1** : 95-100, 1 pl.
- BATE, R. H. 1963. Middle Jurassic Ostracoda from North Lincolnshire. *Bull. Br. Mus. nat. Hist. Geology*, London, **8**, (4) : 173-219, pls. 1-15.
- 1963a. Middle Jurassic Ostracoda from South Yorkshire. *Bull. Br. Mus. nat. Hist. Geology*, London, **9**, (2) : 19-46, pls. 1-13.
- 1964. Middle Jurassic Ostracoda from the Millepore Series, Yorkshire. *Bull. Br. Mus. nat. Hist. Geology*, London, **10** (1) : 1-33, pls. 1-14.
- 1967. The Bathonian Upper Estuarine Series of Eastern England. Part 1 : Ostracoda. *Bull. Br. Mus. Nat. Hist. Geology*, London, **14** (2) : 5-66, pls. 1-22.
- 1969. Some Bathonian Ostracoda of England with a revision of the Jones 1844 and Jones & Sherborn 1888 Collections. *Bull. Br. Mus. nat. Hist. Geology*, London, **17** (8) : 377-437, pls. 1-16.
- BERDAN, J. 1961. In MOORE, R. C. (editor). *Treatise on Invertebrate Paleontology, Pt. Q., Arthropoda*, **3**. xxiii + 442 pp., 334 figs. Kansas.
- BIZON, J. J. 1958. Foraminifères et Ostracodes de l'Oxfordien de Villers-sur-Mer (Calvados). *Rev. Inst. franç., Pétrole*, Paris, **13** : 3-45, 5 pls.
- BLASZYK, J. 1967. Middle Jurassic Ostracods of the Czestochowa Region (Poland). *Acta. palaeont. pol.*, Warsaw, **12** (1) : 1-75. pls. 1-21.

- BRAND, E. & FAHRION, H. 1962. Dogger NW-Deutschlands : 123-158. In *Leitfossilien der Mikropalaontologie*. 432, pp., 59 pls., Berlin.
- & MALZ, H. 1962. *Furhrbergiella* n. g. *Senckenberg. leth.*, Frankfurt a. M., **43** (1) : 1-39, 6 pls.
- BRYCE, J. & TATE, R. 1873. On the Jurassic Rocks and Palaeontology of Skye and Raasay. *Q. Jl geol. Soc. Lond.*, **29** : 317-351.
- CORDEY, W. A. 1962. Foraminifera from the Oxford Clay of Staffin Bay, Isle of Skye, Scotland. *Senckenberg. leth.* Frankfurt a.M., **43**, (5) : 375-409, pls. 46-48.
- DONZE, P. 1962. In Contribution a l'etude Paleontologique de l'Oxfordien Superieur de Trept (Isère) Part III, Ostracodes. *Trav. Lab. Géol. Univ. Lyon.*, N.S., **8** : 125-142, 3 pls.
- & ENAY, R. 1962. Les ostracodes de la limite Dogger-Malm dans L'île Cremiev. *Trav. Lab. Géol. Univ. Lyon.*, N.S., **8** : 143-157, 1 pl.
- DREYER, E. 1967. Einige neue Ostracoden aus dem Ober-Bajoce und Bath der Deutschen Demokratischen Republik. *Freiberger Forsch-ft.-H.*, Leipzig, **213** : 53-61, 1 pl.
- EAGAR, S. H. 1965. Ostracoda of the London Clay (Ypresian) in the London Basin : i Reading District. *Revue. Micropaléont.*, Paris, **8** (1) : 15-32, 2 pls.
- FERNET, P. 1960. Etude Micropaleontologique du Jurassique du Forage de Saint-Felix (Charente). *Revue. Micropaléont.*, Paris, **3** : 19-30, 2 pls.
- FISCHER, W. 1961. Neue Arten des Ostracoden-Gattung *Polycope* SARS, 1865, aus dem oberen Lias (Wurtenburg). *Neues Jb., Geol. Paläont, Mh.*, Stuttgart, **10** : 497-501, 1 fig.
- 1962. Ostracoden der Gattungen *Monoceratina* ROTH, 1928, *Cytheropteron* G. O. SARS, 1865, und andere im Lias Zeta Schwabens. *Neues Jb., Geol. Paläont. Abh.*, Stuttgart, **114**, (3) : 333-345, 2 pls.
- FORBES, E. 1851. On the Estuary Beds and the Oxford Clay at Loch Staffin in Skye. *Q. Jl geol. Soc. Lond.*, **7** : 104-113.
- GLASHOFF, H. 1964. Ostracoden-Faunen und Palaeogeographie im Oxford NW-Europas. *Paläont. Z.*, Berlin, **38**, (1/2) : 28-65, 2 pls.
- GRÜNDEL, J. 1964. Neue Ostracoden aus der deutschen Unterkreide I. *Mber. dt. Akad. Wiss.*, Berlin, **6**, (10) : 743-749, 1 pl.
- 1964a. Neue Ostracoden aus der deutschen Unterkreide II. *Mber. dt. Akad. Wiss.*, Berlin, **6**, (11) : 840-858, 2 pls.
- IMLAY, R. W. 1947. Marine Jurassic of Black Hills area, South Dakota and Wyoming. *Bull. Amer. Assoc. Petrol. Geol.*, **31** : 227-273, 3 figs.
- JONES, T. R. 1849. A monograph of the Entomostraca of the Cretaceous Formation of England. *Palaeontogr. Soc. (Monogr.)*. London, **3** : 1-40, 7 pls.
- 1884. Notes on the Foraminifera and Ostracoda from the deep boring at Richmond. *Q. Jl geol. Soc. Lond.*, **11** : 765-777, pl. 34.
- & SHERBORN, C. D. 1888. On some Ostracoda from the Fullers-earth Oolite and Bradford Clay. *Proc. Bath nat. Hist. Fld. Cl.*, **6** : 249-278, pls. 1-5.
- KAYE, P. 1963. The interpretation of the Mesozoic Ostracod genera of the family Cytherideidae SARS 1925. *Revue Micropaleont.*, Paris, **6** : 23-40, pls. 1-3.
- KILENYI, T. I. 1969. The Ostracoda of the Dorset Kimmeridge Clay. *Palaeontology*, London **12**, (1), 112-160, pls. 23-31.
- KLINGLER, W. 1955. Mikrofaunistische und stratigraphisch-fazielle Untersuchungen im Kimmeridge und Portland des Weser-Aller-Gebietes. *Geol. Jb.*, Hannover, **70** : 167-246, pls. 6-21.
- MALZ, H. & MARTIN, G. P. R. 1962. Malm NW-Deutschland. In *Lietfossilien der Mikropalaontologie* : 159-224, pls. 22-27. Berlin.
- KOLLMANN, K. 1960. *Cytherideinae* und *Schulerideinae* n. subfam. (Ostracoda) aus dem Neogen des östlichen Österreich. *Mitt. geol. Ges. Wien.*, **51** : 89-195, pls. 1-21.
- LEE, G. W. 1925. A description of the Mesozoic Rocks of E. Sutherland and Ross (Helmsdale, Brora, Golspie, Shardwick and Ethie). In READ, H. H. et. al. The Geology around Golspie. Sutherlandshire. *Mem. geol. Surv. Scotland*, Edinburgh, 143 pp.

- LJUBIMOVA, P. S. 1955. Ostracodes of the Mesozoic deposits in the Volga-Ural region. *Trud. vses. neft-nauch. issled. geol. Inst. (VNIGRI), Leningrad (N.S.)* **84** : 3-189, pls. 1-13. (In Russian).
- MACCULLOCH, J. 1819. A description of the Western Islands of Scotland. London.
- MACCREGOR, M. 1934. The sedimentary rocks of north Trotternish, Isle of Skye. *Proc. Geol. Ass. London*, **45** : 389-406.
- MALZ, H. 1962. *Palaeocytheridea* im obern Dogger N.W. Deutschlands (Ostracoda). *Senckenberg leth.*, Frankfurt a.M., **43**, (3) : 235-241, 1 pl.
- MANDELSTAM, M. I. 1947. Ostracoda from Middle Jurassic Deposits of the Mangislaka Peninsula (Eastern side of the Caspian). In *Mikrofauna, Petroleum Occurrence, Caucasus, Emba and central Asia. Trud. vses. neft-nauch issled. geol. Inst. (VNIGRI), Leningrad-Moscow* : 239-259, 2 pls. [In Russian.]
- 1959. Ostracodes of the Palaeogene deposits of Central Asia. In *Microfauna of the U.S.S.R.*, **10**. *Trud. vses. neft-nauch issled. geol. Inst. (VNIGRI)*, Leningrad (N.S.) **136** : 442-543, pls. 1-9. [In Russian.]
- 1960. In ORLOV, J. A. (editor). *Fundamentals of Palaeontology* [8] *Arthropoda, Trilobita and Crustacea*, 515 pp., 17 pls. Moscow.
- MÜLLER, G. W. 1894. Die Ostracoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. *Naples, Staz. Zool. Fauna und Flora des Golfes von Neapel. Monogr.*, **31** : 1-404, pls. 1-40.
- 1912. Ostracoda. In *Das Tierreich, ein Zusammenstellung und Kennzeichnung des nezenten Tierformen*. **31** : 1-434, 92 figs. Berlin.
- OERTLI, H. J. 1957. Ostracodes du Jurassique superieur de Bassin de Paris. (Sondage Vernon I). *Rev. Inst. franç Pétrole.*, Paris, **12**, (6) : 647-695, pls. 1-7.
- 1959. Malm-Ostracoden aus dem Schweizerischen Juragebirge. *Denks. schweiz. naturf. Ges.*, Zurich, **83** : 1-44, pls. 1-7.
- 1963. Mesozoic Ostracod faunas of France. Leiden. pp. 1-57, 90 pls.
- PETERSON, J. A. 1954. Jurassic Ostracoda from the "Lower Sundance" and Rierdon Formations, western interior United States. *J. Paleont.*, Tulsa, **28**, (2) : 153-176, pls. 17-19.
- 1954a. Distribution of Marine Upper Jurassic Ostracoda, western interior, United States. *J. Paleont.*, Tulsa, **28**, (2) : 513-514.
- PLUMHOFF, F. 1963. Die Ostracoden des Oberaalenum und tiefen Unterbajocium (Jura) des Gifhorner Troges, Nordwestdeutschland, *Abh. senckenb. naturforsch Ges.*, Frankfurt a.M., **503** : 1-100, pls. 1-12.
- ROTH, R. 1928. *Monoceratina* : A new genus of Ostracoda from the Pennsylvanian of Oklahoma. *J. Paleont.*, Tulsa, **2**, (1) : 15-19.
- SARS, G. O. 1866. Oversight at Norges marine Ostracoden. *Förh. Vidensk Selsk. Krist. Christiana*, **7** : 1-130. Norwegian and Latin.
- 1922-1928. An Account of the Crustacea of Norway. Bergen Museum. (Norway), **9** : 1-277.
- SCHWAGER, C. 1866. In OPPEL, A. & WAAGEN, W. Über die Zone des *Ammonites transversarius*. *Geogn. paläont. Beitr.*, **1** (2) : 205-318. Munich.
- SHARAPOVA, E. 1937. The stratigraphy of Mesozoic deposits in the Emba region on the basis of Ostracoda. *Trud. vses. neft-nauch. issled. geol. Inst. (VNIGRI), Leningrad, Series A*, **106** : 69-86, pls. 1-2. [Russian with English diagnoses.]
- STEGHAUS, H. 1951. Ostracoden als Leitfossilien der Olfelder Waitze und Fuhrberg bei Hannover. *Paläont. Z.*, Berlin, **24**, (3-4) : 201-224, 2 pls.
- SWAIN, F. M. 1946. Upper Jurassic Ostracoda from the Cotton Valley Group in northern Louisiana : the genus *Hutsonia*. *J. Paleont.*, Tulsa, **20** (2) : 119-129, pls. 20-21.
- & PETERSON, J. A. 1951. Ostracoda from the Upper Jurassic Redwater Shale member of the Sundance Formation of the type locality in South Dakota. *J. Paleont.*, Tulsa, **25**, (6) : 796-807, 2 pls.

- SWAIN, F. M. & PETERSON, J. A. 1952. Ostracodes from the upper part of the Sundance Formation of South Dakota, Wyoming, and Southern Montana. *Prof. Pap. U.S. geol. surv.*, Washington, **234** (A) : 1-17, pls. 1-2.
- SYLVESTER-BRADLEY, P. C. 1948. Bathonian ostracods from the Boueti Bed of Langton Herring, Dorset. *Geol. Mag., London, Hertford* : **85** (4) : 185-204, pls. 12-15.
- TERQUEM, O. 1885. Les entomostracés-ostracodes du système oolithique de la zone à *Ammonites parkinsoni* de Fontoy (Moselle). *Mém. Soc. géol. Fr. Ser. 3.*, Paris, **4** : 1-46.
- 1886. Les Foraminifères et les Ostracodes du Fuller's-earth des environs de Varsovie. *Mém. Soc. géol. Fr. Ser. 3.*, Paris, **4** : 1-112.
- TRIEBEL, E. 1951. Einige stratigraphisch wertvolle Ostracoden aus dem hoberen Dogger Deutschlands. *Abh. senckenb. naturf. Ges.*, Frankfurt a.M., **485** : 87-102, pls. 44-49.
- & BARTENSTEIN, H. 1938. Die Ostracoden des deutschen Juras. I. *Monoceratina*—Arten aus dem Lias und Dogger. *Senckenbergiana.*, Frankfurt a.M., **20**, (6) : 502-518, pls. 1-3.
- TURNER, J. 1966. The Oxford Clay of Skye, Scalpay and Eigg. *Scott. J. Geol.*, Edinburgh, **2**, (3) : 243-252.
- ULRICH, E. O. 1894. The Lower Silurian Ostracoda of Minnesota. *Rep. Minn. geol. nat. Hist. Surv.*, Minneapolis, **3**, (2) : 629-693, pls. 43-46.
- WEDD, G. B. 1910. In PEACH, B. N., et al. The Geology of Glenelg, Lochalsh, and South-east Skye. *Mem. geol. Surv. Scotland.*, Edinburgh, 206 pp.
- WEINGEIST, L. 1949. The Ostracode genus *Eucytherura* and its species from the Cretaceous and Tertiary of the Gulf Coast. *J. Paleont.*, Tulsa, **23**, (4) : 364-379, pl. 73.
- WICHER, C. A. 1938. Microfaunen aus Kreide und Jura, insbesondere Nordwestdeutschlands, I. Teil : Lias alpha bis elipson. *Abh. preuss. geol. Landesanst.* Berlin : 1-16, 27 pls.
- WIENHOLZ, E. 1967. Neue Ostracoden aus dem norddeutschen Callov. *Freiberger. ForschHft.-H.* Leipzig, **213** : 23-51, pls. 1-5.

## V. APPENDIX

The ostracods on which this paper is based were originally deposited in the collections of the Geology Department of Hull University. A large part of this collection has since been transferred to the British Museum (Natural History). The revised registration numbers are listed below :

British Museum Nos.	Hull University Nos.	British Museum Nos.	Hull University Nos.
Io.5030	Hu-16-J-4	Io.5046	Hu-17-J-11
Io.5031	Hu-16-J-6	Io.5047	Hu-17-J-12
Io.5032	Hu-16-J-7	Io.5048	Hu-17-J-28
Io.5033	Hu-16-J-8	Io.5049	Hu-17-J-29
Io.5034	Hu-16-J-9	Io.5050	Hu-17-J-30
Io.5036	Hu-16-J-12	Io.5051	Hu-17-J-31
Io.5037	Hu-16-J-13	Io.5052	Hu-17-J-32
Io.5038	Hu-16-J-24	Io.5053	Hu-17-J-33
Io.5039	Hu-16-J-25	Io.5054	Hu-17-J-34
Io.5040	Hu-16-J-31	Io.5055	Hu-17-J-35
Io.5041	Hu-16-J-40	Io.5056	Hu-17-J-36
Io.5042	Hu-17-J-7	Io.5057	Hu-17-J-40
Io.5043	Hu-17-J-8	Io.5058	Hu-18-J-9
Io.5044	Hu-17-J-9	Io.5059	Hu-18-J-10
Io.5045	Hu-17-J-10	Io.5060	Hu-18-J-12